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including 4 scientists, with a flight capability of 4 hours 30 minutes. Its normal service speed is 115 meters per second, or 414 km/h. The aircraft has an expected life of 5,000 hours, equivalent to about 10 years of scientific use assuming 400 hours of flight per year.

The aircraft has been completely redesigned for the particular tasks envisaged: *in situ* measurements, sampling and remote sensing using onboard instruments. In particular, its flight time capability and the onboard electrical power have been increased. Structural modifications have been made so that the onboard sensors can be mounted either on a 5-meter probe or around the fuselage forward or aft of the wing. The after fuselage has been fitted with mirrors so that the Lidar laser beam can be directed upwards and downwards. The aircraft is designed to operate either in the "atmospheric microphysics" configuration or in the "remote sensing" configuration.

ARAT is a veritable flying laboratory. Computer equipment is carried for an immediate analysis of data. Results are displayed continuously and the flight plan can be modified accordingly. All data will be stored to constitute a bank of specific data: the Volotheque or flying data bank.

About a dozen laboratories have already applied to use ARAT. Research is focused on four main topics calling for highly specific measurements:

- thermodynamics and clear air turbulence
- thermodynamics, turbulence and the microphysics of clouds
- radiation measurements
- physical chemistry and aerosols.

Airbus Partners Disagree on Future Directions

90CW0008 Frankfurt/Main FRANKFURTER ALLGEMEINE ZEITUNG in German 22 Sep 89 p 17

[Text] Coming on the heels of the negotiating marathon to save the deteriorating retail company Co op, Hans Friedrichs now faces new difficult talks, this time in his capacity as chairman of the board of CIE Airbus Industrie. Among the agenda items for the meeting of the Airbus board of directors Friday in London are the two reports on the question of whether a second final assembly plant—in addition to the one in Toulouse—should be set up in the FRG for the Airbus A 320. The site foreseen for this is the Messerschmitt-Boelkow-Blohm (MBB) plant in Hamburg. However, a decision on this is not expected, given the German-French differences of opinion on this issue. An additional factor is that Friedrichs is currently having problems with the German negotiating partners, since the Daimler-MBB merger is not yet complete and a great deal is still pending. Still, the meeting should produce a final decision on construction of the elongated Airbus model A 321 and on distributing the components among the countries belonging to the consortium. Finally, as always, there will be reports on sales and conditions.

With regard to final assembly in the FRG, the French aviation company Aerospatiale and the German MBB group have from the very outset held differing opinions. MBB calculated that additional assembly in the FRG would result in a significant savings for the total system, while Aerospatiale did not see major cost advantages and thus rejected a second assembly site. This is why Chancellor Helmut Kohl was approached; he in turn contacted French President Francois Mitterrand. In order to reach a decision, two reports were finally commissioned, a German one by former Krupp- und Saarstahl head Juergen Krackow and a French one by industrialist Jacques Benichou. As expected, the two reports reach different conclusions. Just as MBB, Krackow figures on significant savings, while his French partner sees a lower figure.

This tug-of-war is regarded by insiders as another example of the fundamental difficulties present in the Airbus consortium. Although Airbus is a European project, they say, the partners think and act on a largely national level. For example, to this day it has not been possible to fully comprehend the cost structures in terms of the national intercompany prices towards Airbus Industrie in Toulouse. Around one-third of the Airbus comes from the FRG, while France plays a leading role in the future-oriented technical parts. At the same time, of the total current orders of DM 1.2 billion for aircraft in production, the FRG has a share of DM 922 million, while France and Great Britain each have a good DM 140 million. In many quarters, one solution to the European Airbus difficulties is seen in a reorganization of production and of the company itself. The Germans point out that cost reductions have already been achieved by invitations to bid in subsections. Converting CIE Airbus Industrie into a holding company under European law or privatizing it was recently rejected by Aerospatiale president Henri Martre. Aerospatiale and MBB each have a 37.9 percent share in Airbus Industrie, with British Aerospace holding 20 percent and the Spanish company Casa 4.2 percent.

Italy: CNR's Microgravity Research Projects Outlined

90MI0017 Rome SPAZIO INFORMAZIONI in Italian 25 Sep 89 p 4

[Text] The CNR's [National Research Council] Institute for Applied Physical Chemistry of Materials (ICFAM) in Genoa is planning a series of interesting microgravity experiments to be carried out over the next few years on sounding rockets, EURECA [the European Retrievable Carrier], and the Spacelab. The first experiment, referred to as MITE (Measurement of Interfacial Tension Experiment), involves the development of a new system for the detection of interfacial tension between liquids that cannot be mixed. The system will be used on board the MASER 4 sounding rocket to be launched from the polygon at Kiruna, Sweden next spring. MITE was financed by the European Space Agency (ESA), with

contributions by ICFAM for the scientific section, Officine Galileo and CISE [Center for Data, Studies, and Experimentation] for the development of the facility, and by the Milan Polytechnic's Interdepartmental Space Research Consortium (CIRS) for the thermal design of the experiment.

Another project involves two other experiments with the Multifurnace Assembly to be placed on board EURECA-1, which will be launched by the Atlantis space shuttle on 16 May 1991. These two experiments, developed by ICFAM and financed by the Italian Space Agency (ASI), will study the interactions between liquid metals and ceramic materials under space microgravity conditions. The cooperation between ICFAM and CIRS will result in another experiment using the Isothermal Heating Facility to be placed on board the German Spacelab-D2, scheduled to be carried into orbit by the new Endeavour shuttle on its first space flight in February 1992. This last experiment will study heterogeneous nucleation in nonmixable liquid metals.

Italy: Pisa Space Center's Activities Described

89MI0473 Rome SPAZIO INFORMAZIONI in Italian 20 Jul 89 p 7

[Text] The Space Center, a space technology laboratory set up with the support of the Pisa Research Consortium, was recently opened in Pisa. The Pisa Research Consortium was established by the National Research Council (CNR) and IRI [Institute for the Reconstruction of Industry]. Its members include the University, the Scuola Normale Superiore, and the Scuola Superiore di Studi Universitari of Pisa, as well as the National Institute of Nuclear Physics (INFN), local government bodies, the Pisa Chamber of Commerce, and numerous businesses.

A fact that emerged from the recent opening ceremony was that the Space Center's laboratory has considerable potential in terms of its equipment which, as a whole, form a complex that is equaled by only a few others in Europe. The laboratory's activities will initially center on research in advanced propulsion systems. In particular, studies already in progress involve magnetoplasmadynamic (MPD) propulsors, various kinds of arc jet engines, and field emission propulsors (FEEP). A study has also been undertaken on the possibility of carrying out a flight demonstration of a 1 kw arc jet engine, fitted aboard the EURECA [European Retrievable Carrier] within 4-5 years. The equipment at the Space Center will also be used for aerothermodynamics research and various other experiments in simulated vacuum conditions. Finally, theoretical and experimental studies will be undertaken in collaboration with other university institutes to acquire know-how on the development of remote-control space robot systems.

Marconi Wins ESA Laser Communications Contract

89AN0354 Chichester INTERNATIONAL TELECOMMUNICATIONS INTELLIGENCE in English 15 Sep 89 p 10

[Text] Marconi Space Systems company has been awarded a 630,000 pound contract by the European Space Agency (ESA) to design and build a prototype laser intersatellite communications system. The prototype will be used to develop and evaluate space equipment for future links between geostationary satellites.

Satellite communications over long distances, say, between Europe and Asia, currently demand a double-hop involving two spacecraft and an intermediate earth station. The introduction of direct communications links between satellites in geostationary orbit will not only eliminate the need for intermediate earth stations but also reduce the transmission delay of double-hopping.

Marconi will be the prime contractor for the ESA programme, supported by Standard Telecommunications Laboratories, Pilkington, and Matra Espace. It is the fifth space laser contract to be won by Marconi in recent months, earlier customers having included Matra, the United Kingdom Royal Aerospace Establishment, the British National Space Center and the European Space Agency.

BIOTECHNOLOGY

EC Selects 23 Projects for ECLAIR Program

90AN0038 Brussels EUROPE in English 21 Oct 89 p 8

[Report: "Research: European Commission Choses 23 Projects for ECLAIR Programme (Agro-Industrial Research for the Environment)"]

[Text] The European Commission has made sure that the ECLAIR [European Collaborative Linkage of Agriculture and Industry Through Research] programme gets off to a rapid start. The programme concerns agro-industrial research in favour of the environment. Only a few months after its adoption, the Commission chose 23 collaborative projects destined to receive Community funding.

These projects will cover all links in the agro-industrial chain, from agricultural inputs and production to the industrial transformation and processing of agricultural produce; from the development of new crop species to new market outlets for more traditional agricultural products.

They will bring together around 200 organisations from both the public and private sectors in the pursuit of common research objectives. Participants include industrial firms (especially SMEs [small- and medium-sized enterprises]), universities, research institutes, and even agricultural cooperatives. Most of them have never received or applied for EC research funding before.

ECLAIR was adopted by the Council earlier this year and given a budget of ECU 80 million. Since then, the Commission has examined 220 high-quality proposals and is negotiating contracts with the successful ones.

The programme is designed to encourage "precompetitive" research, that is, applied research which still falls

short of immediate commercial applications and which offers opportunities for industrial collaboration. The Community cofinances these projects with the partners.

Among the selected projects which are expected to have a direct bearing on agriculture, there will be the development of:

- New animal vaccines for cattle and sheep;
- Seaweed extracts as plant nutrients;
- Environmentally safe pesticides for olive trees (derived from micro-organisms);
- New varieties of maize and tomatoes which are resistant to disease and insects;
- Integrated technologies for the harvesting and processing of maize and sunflowers which bring added value to the farmer;
- Fish farming techniques for marine species of fish.

Among the selected projects which focus on industrial applications, there will be:

- The extraction and transformation of vegetable oils for the production of lubricants, detergents, biodegradable plastics and other uses;
- The development of biodegradable polymers from bacteria and plants;
- The use of plant fibres in plastics, pulp and paper processing;
- The development of natural flavours from plant extracts;
- The production of galacturonic acid from beet and citrus pulp (used as an acidulant or emulsifying agent, and in food and animal feed).

COMPUTERS

Logica Joins ESPRIT Speech Recognition Work

90AN0019 Chichester INTERNATIONAL TELECOMMUNICATIONS INTELLIGENCE in English 9 Oct 89 p 7

[Text] Logica has begun work on a 4-million-pound European research project aimed at developing new speech recognition techniques for use in adverse noise conditions, such as in factories, cars and aircraft cockpits.

The project, which is known as Adverse-environment Recognition of Speech (ARS), was approved in 1988 by the European Commission as part of the ESPRIT (European Strategic Programme for Research and Development in Information Technology) Programme. ARS is led by the Center for Telecommunications Research and Laboratories SpA (CSELT) in Italy and includes contributions from Logica and Keele and Cambridge Universities as well as from French, Spanish and Italian partners.

Logica's work will involve the creation of new algorithms for continuous recognition of speech, and for speaker independent recognition to produce systems which do not need to be trained by individual users.

Logica's experience in speech recognition includes the development of LOGOS—the first continuous speech recognition system. The company is also involved in another ESPRIT project called Speech UNderstanding and DIALogue (SUNDIAL), which is aimed at speech access to computer systems over the telephone.

European Software Center Established in Berlin

90MI0004 Bonn BMFT JOURNAL in German No 4, Aug 89 p 2

[Text] Only software enables the user to operate a computer. FRG users satisfy about 45 percent of their software requirements from software houses, almost all of which are medium-sized firms. About 30 percent were set up by hardware manufacturers and 25 percent are independent developments. In 1986, the software market (excluding in-house developments by users) was worth about DM13 billion, with an annual growth rate of 15 percent.

As a rule, new software is written every time a requirement arises. Even when usable parts already exist, they usually cannot be fitted together, since they do not match. Medium-sized software houses are the ones that suffer most from this. First of all, they are particularly dependent on maximum working efficiency, which could be considerably increased by reusing previously developed and tested software parts. Secondly, assembling software out of parts would make it possible to share work among several software houses in the event of large orders from customers.

The Eureka Software Factory (ESF) project will represent a significant advance for industrial-scale software production. Ten firms and three research institutes from five European countries have joined forces on this project.

By analogy with manufacturing engineering, the term software factory is taken to mean that computer-aided tool programs are used to recycle software and assemble software packages from individual, recyclable parts. This requires the development of special processes, interfaces, and standards, so that program parts can be linked together with precision. This kind of factory-style software production will not only increase the productivity and reliability of the software development process, but at the same time enable computer programs to be assembled from several different sources. The Eureka Software Factory is thus establishing ideal conditions for close cooperation in the future among European software manufacturers. The ESF headquarters in Berlin is the heart of this joint cooperation. The number of employees is scheduled to increase from 15 to 40 by 1990. The ESF's overall cost is estimated to be DM300 million over a 10-year period.

FACTORY AUTOMATION, ROBOTICS

Italy: New CNR Robotics Program Described

90MI0013 Milan L'ELETTROTECNICA in Italian Aug 89 pp 720-721

[Text] The CNR's [National Research Council] Finalized Robotics Project began this year. Its goal is to strengthen those industrial and scientific sectors in Italy that are directly involved in robotics planning, application, and research requirements. Through the design and development of experimental prototypes, the project aims at developing the capabilities that characterize the functional systems contributing to the construction of robots used for various practical applications.

The CNR will provide 67,777 billion lire in funding over a 5-year period (35,080 billion lire in the initial 3-year period.)

During the first 3 years, the project is expected to involve 867 man-years (648 from the public sector and 210 from the private sector.)

The lack of available funding and the growing areas of interest over the 5-year period have created considerable problems. One problem, in particular, is activating all the operational units already chosen in the first year, which represents only 13 percent of the total financing. Even if management costs were reduced to a minimum, however, the amount of financing available for the operational units' first year of activity would amount to 8,059 billion lire, less than 12 percent of the expected total financing. The project is directed by Prof Umberto Cugini, and is divided into four subprojects:

- 1. Robot Structure (Prof Ario Romiti, coordinator);
- 2. Robot Programming (Prof Marco Somalvico, coordinator);
- 3. Sensors and Actuators (Prof Vincenzo Tagliasco, coordinator);
- 4. Robot Control (Prof Fernando Nicolo, coordinator).

Fields of research that coincide with the results of the feasibility study or, in certain cases, that determine a subset, are being identified within each subproject.

Each field of research contains one or more goals involving one or more operational units.

The research field has been defined as an area in a wider cultural area in which specific goals can be defined. The goal is conceived of as a group of operational units whose objective is to create a prototype or model, or to achieve a common result, although each unit has its own responsibility.

The grouping of various operational units according to goals permits one of the finalized project's objectives to be achieved: to increase cooperation among various sectors, including universities, the CNR, and industry.

A research field called "Market Analysis for Robotics" has been instituted in addition to the four subprojects. Given its general and transversal features, it was placed outside the subprojects under the direct control of management. This field will deal with the study and investigation of the needs and problems of small- and medium-sized industries using robotics.

The need for robotization and automation in manufacturing industries will also be determined.

Research in the "Market Analysis for Robotics" project will begin in the project's second year.

At the end of the 3-year period, the expected objectives are functional research prototypes (both hardware and software) that can be considered for integration in the following 2-year period.

The structure of the Finalized Robotics Project is shown in Diagram 1.

Financial requirements for new projects to be financed by the CNR in the 1989-1992 period are shown in Table 1. The Finalized Robotics Project is among these.

The project's offices are located at the Instituto Macchine Utensili IMU-CNR [(IMU-CNR Institute for Machine Tools)], Via Ampere 56, 20131 Milan, tel (02) 266 801 93, Telex 313 839 MUACNR I, fax (02) 266 55 58.

Structure of the Finalized Robotics Project

	0.1	Analysis of the Robotics Market
Subproject 1, Robot Structure	1.1	Modular Structures
	1.2	Design and Application Criteria in Semi-Industrial Models
	1.3	Structural Analysis under Dynamic Conditions
	1.4	Evolved Holding Devices
	1.5	Mobile Robots
	1.6	New Mechanical Models with Surplus Degrees of Freedom
Subproject 2, Robot Programming	2.1	Architecture and Microcomputer Arrays
	2.2	Programming Systems and Languages
	2.3	Artificial Intelligence Methods and Technology

Structure of the Finalized Robotics Project (Continued)

Subproject 3, Sensors and Actuators	3.1	Sensors
	3.2	Integrated Sensor Systems
	3.3	Actuators
	3.4	Activation
	3.5	Vision
Subproject 4, Robot Control	4.1	Hybrid Dynamic Control and Interacting Robots
	4.2	Updating Robots Currently in Use
	4.3	Movement Planning
	4.4	Layout and Management of Robotized Systems

Financial Requirements for the 1989-1993 Period for Development of the CNR's New Finalized Projects (in billions of lire)

Finalized Projects	Years					
	1989	1990	1991	1992	1993	Total
Construction	2,814	17,100	28,062	29,832	27,545	115,353
Electrooptical Technology	9,857	10,688	11,685	10,951	9,771	52,952
Superconductor Technology	4,929	11,368	14,366	7,836	0	38,499
Robotics	8,871	11,076	15,133	15,388	17,309	67,777
Special Materials	9,857	17,197	24,423	20,297	12,842	84,616
Computer Science and Parallel Computing	11,829	12,242	12,642	13,122	13,586	63,421
International Activities	1,971	2,429	2,969	3,210	0	10,579
Biotechnology	15,771	16,226	16,857	17,465	18,053	84,372
Telecommunications	11,829	13,797	20,017	15,483	17,402	78,528
Fine Chemistry	17,743	18,540	19,190	19,860	20,554	95,887
Total	105,471	130,663	165,344	153,444	137,062	691,984

LASERS, SENSORS, OPTICS

'Atome' Laser Measurement System Described

89AN0348 Paris FRENCH TECHNOLOGY SURVEY in English Sep 89 p 18

[Text] The Atome system, built by the CETIM [Technical Center for Mechanical Industries] Senlis dimensional metrology laboratory, automatically records the external profile of an object from a distance and without material contact.

The measurement involves characterising the shadow produced as the object interacts with a beam of light in order to deduce its external dimensions.

The system allows dimensional checking to be automated by means of a learning programme which requires no special computer skills on the part of the operator.

The system brings high precision to the measurement of, for example: diameters, angles, lengths, gauge lengths, radius of coverture, chamfer, thread diameters, ovality, concentricity and so on.

The measurements can be stored and processed using a Statistical Processing Program (SCP).

The possible applications extend to all sectors of industry: the automobile industry and its subcontractors, ship building, aerospace, packaging, screw cutting, strain gauges, plastics and so on.

MICROELECTRONICS

'Euroelectronics' Interest Group Set Up

90AN0005 Brussels EUROPE in English 4 Oct 89 p 17

[Article: "An 'EEIG'—Eurelectronics Small Business Association—Is Created"]

[Text] The professional organisations CEAM (Metallurgical Study and Assessment Center) in Barcelona, Elettrimpex (Enterprises Consortium for Electronics Export Development) in Milan, and SNESE (National Syndicate of Electronic Subcontracting Enterprises) in Paris have created a European professional structure, the EEIG (European Economic Interest Grouping) ESBA

(Euroelectronics Small Business Association). This group's statutes were adopted in Brussels at the end of September 1989. ESBA's executive board has one representative for each member organisation and is chaired by Mr J.P. Vittot, president of SNESE. ESBA has a federal structure, and its purpose is to bring together national or regional professional organisations of SMIs (small and medium-sized industries) in the electronics sector and to propose to them programmes of information, training, and strategy support activities, taking into account new European data, including information on the completion of the large unified market of 1992 and collaboration and cooperation with non-European partners (particularly the United States and Japan).

ESD Completes R&D on VHSIC Signal Processor

90AN0013 Paris LA LETTRE HEBDOMADAIRE DU GIFAS in English No 1493-1, 7 Sep 89 p 2

[Article: "ESD: First Very High Speed Integrated Circuit (VHSIC) Signal Processor"]

[Text] Electronique Serge Dassault (ESD) has now completed the design and built its first signal processor under the High-Speed Integrated Circuits (CITGV) program. This program was launched by the French Defence Ministry to comply with the performance needs of new equipment: miniaturization and increased computational power. ESD will use it in its AD4A homing device carried by the air-air Mica and surface-air Aster missiles. Other military applications are already being planned. This signal processor has a very high power capability and is incorporated within an integrated silicium circuit having a surface of just over 1 square centimeter. ESD designed and built this circuit and then proceeded to lay out production facilities at the Electronics and Information Technologies Laboratories (LETI) of Grenoble, for CMOS (Complementary Metal Oxide Semiconductor) technology with a 1.25-micron engraving dimension. With this stage, ESD has fully validated the conception of the "micronic" generation circuit as well as the fabrication process. The next step will be to have Matra MHS prepare Super CMOS (SCMOS) technology before the end of this year for reducing the engraving dimension from 1.25 microns to 1 micron. Work leading up to the new processor has been funded jointly by the Defence Ministry (Research, Studies, and Technologies Directorate (DRET)), the Electronics and Information Technology Service (STEI), and ESD.

NUCLEAR ENGINEERING

FRG Research Association's Report on Nuclear Magnetic Resonance Published

90MI0002 Bonn TECHNOLOGIE-NACHRICHTEN MANAGEMENT-INFORMATIONEN in German No 510, 30 Aug 89 pp 7-8

[Excerpt] In international terms, there is a considerable shortfall in the number of top performance NMR [Nuclear Magnetic Resonance] spectrometers in the FRG. This emerged from an inventory analysis at FRG universities and research institutes, carried out by the German Research Association (DFG) equipment committee.

In recent years, nuclear magnetic resonance spectroscopy has developed into one of the primary methods of analyzing structures in chemistry, and has also found its way into medical diagnostics. It determines the precise atomic structure of molecules and their three-dimensional form; this is of crucial significance for the properties of the material in question, whether plastics, semiconductors for electronics, or pharmaceutical reagents.

Although more than DM90 million have been spent to purchase 158 NMR spectrometers in the last 10 years, both under the major equipment program set up to implement the law financing university building and under DFG funding procedures, there are at present only 11 units in the top performance class in the FRG. The DFG study demonstrates that at least 20 more of these high performance spectrometers, each costing nearly DM3 million, will have to be installed in the next 2 years if international standards are to be met. As the report explains, there is also a lack of both positions for NMR specialists and young scientists qualified in this field.

The report presents the situation separately for both fluid and solid-state spectrometers. An overview of the fields in which each type of unit is used completes the study. [passage omitted]

SCIENCE & TECHNOLOGY POLICY

New EUREKA R&D Projects Described

36980255 Paris AFP SCIENCES in French 22 Jun 89 pp 1-11

[Report: "Research Policy and Organization: R/D-EUREKA/Europe—89 New EUREKA Projects Adopted in Vienna"]

[Text] The Europe of technological cooperation is doing better and better, especially in the areas of electronics and the environment, if one is to believe the ministers of research of the 18 countries and the European Commission, members of EUREKA, meeting in Vienna on 18 and 19 June for their 7th conference in 4 years.

No less than 89 new projects of cooperation among European industrialists, supported by public funds, or a total package amounting to 1 billion ECUs, have been added to the EUREKA list, thus bringing the total up to 297 programs. "Ten percent have already been completed and 15 percent are in the final phase," specified Mr Antonio Ruberti, Italian minister of research and president of the program for the coming 9 months, to the press.

In addition to the wave of new projects, 24 with French participation, 33 West German and 12 British, the notable fact of this meeting in Vienna remains the major

place reserved for the environment and electronics. Henceforth, France is participating in 127 projects, or 40 percent of the total and 30 percent of the overall financing of EUREKA.

EUROENVIRON [Euro-Environment], an "umbrella" program aimed at eliciting concrete technological innovation proposals, was put into place in this manner. It is to receive innovations from industrialists in the areas of "clean" technologies, such as the development of biodegradable plastics, or less polluting industrial processes.

"This perfectly illustrates the originality and the vocation of EUREKA," stressed Mr Hubert Curien, the French minister of research. He recalled that EUREKA was geared toward products and systems, but also allowed for finding solutions to global problems, such as the environment.

EUREKA Projects: Distribution by Sectors

Total EUREKA Projects Approved	297	Projects with French Participation	127
Biotechnology/Biomedical	54	Biotechnology/Biomedical	21
Production Techniques/Robotics	63	Production Techniques/Robotics	31
Computer Science	47	Computer Science	20
Microelectronics	17	Microelectronics	9
Communication	14	Communication	6
New Materials	30	New Materials	14
Energy	12	Energy	6
Laser	15	Laser	7
Transportation	14	Transportation	6
Ocean/Urbanization/Environment	31	Ocean/Urbanization/Environment	7

Total Cost of Projects Divided by Conference and by Technological Sector: Totality of Labeled Projects (Figures based on 297 Projects—in MF (million francs) HT)

Location	Bio	Comp	Pro	Ene	Las	Com	Mic	Tra	Oce/ Env/ Urb		Total
Hanover	18.2	409.0	140.0	698.5	0.0	95.0	0.0	0.0	0.0	840.0	2200.7
London	807.8	3937.5	2001.3	750.1	211.9	39.9	2000.0	923.6	5440.4	1627.9	17740.4
Stockholm	183.7	1067.8	375.3	141.3	464.1	75.6	479.8	1546.4	15.4	0.0	4349.4
Madrid	305.6	642.5	1318.5	198.6	250.4	1057.6	317.9	93.2	220.9	735.7	5140.9
Copenhagen	886.5	121.9	780.6	25.9	17.0	140.0	212.6	60.5	89.3	152.6	2486.9
Vienna	563.6	2398.1	1231.1	220.5	226.8	55.1	720.1	187.7	120.8	531.8	6255.6
Total	2765.4	8576.8	5846.8	2034.9	1170.2	1463.2	3730.4	2811.4	5886.8	3888.0	38173.9

Global Financial Situation and Relative Share of France—(outside JESSI)

Location	Project With French Participation			Projects Without French Participation		Total EUREKA	
	Number	Total Cost	French Share	Number	Total Cost	Number	Total Cost
Hanover (Nov. 85)	6	2182.5 MF (million francs)	541.2 MF	1	18.2 MF	7	2200.7 MF
London (June 86)	39	16582.6 MF	6415.7 MF	18	1157.8 MF	57	17740.4 MF
Stockholm (Dec. 86)	16	3331.6 MF	1384.6 MF	20	1017.8 MF	36	4349.4 MF
Madrid (Sept. 87)	20	2572.6 MF	873.7 MF	35	2568.3 MF	55	5140.9 MF
Copenhagen (June 88)	22	1334.9 MF	550.1 MF	31	1152.0 MF	53	2486.9 MF
Vienna (June 89)	24	2732.9 MF	841.1 MF	65	3522.7 MF	89	6255.6 MF

Global Financial Situation and Relative Share of France—(outside JESSI) (Continued)

Location	Project With French Participation			Projects Without French Participation		Total EUREKA	
	Number	Total Cost	French Share	Number	Total Cost	Number	Total Cost
Total	127	28737.1 MF	10606.4 MF	170	9436.8 MF	297	38173.9 MF
		4105.3 MECU (million ECUs)	1515.2 MECU		1348.1 MECU		5453.4 MECU

However, the uncontested star of the Vienna meeting remains JESSI [Joint European Submicron Silicon Program], which brings together Siemens, Philips, and Thomson-SGS, as well as the EEC laboratories, in a program endowed at the rate of 27 bilion francs over 8 years. Its implementation phase has been included in the program, after the study phase, with an initial endowment of approximately 4 billion francs.

Its objective: make it possible for the Europeans to maintain competitiveness in the area of tomorrow's strategic electronic components, the common use memories (64 Megabytes of actual memory by 1995) and the microprocessors indispensable to the computers of the future, but also to the new high definition television sets. Tinysilicon chips which tomorrow we will have to be able to engrave with a precision superior to 0.3 microns.

A sizeable program, with its total of 27 billion francs, compared to the 40 billion francs (outside the adopted JESSI phase) represented by all the other 296 projects in the EUREKA program. Compared to this impressive sum, other projects such as COPAL, the Franco-Spanish project, with its 30 million francs seem minute.

A few others are respectable in size, however: 1.9 billion francs for Amadeus, which is to set up an international travel reservations network with Arab partners (United Arab Emirates). It should be noted, however, that Amadeus, supported by Air France, will compete with another project within EUREKA, which was also adopted in Vienna, specifically Galileo.

It should be noted that, for the first time, Yugoslav (five projects) and Hungarian (two projects—lasers and robotics) firms are participating in EUREKA projects. Responding to this issue, Mr Rubberti said: "The vocation of EUREKA is not to turn Europe into a fortress, but to have an open policy. These kinds of decisions belong to the industrialists, given that they are free to choose the partners with whom they would like to collaborate."

One should also note the entering of the lists of Locstar, the European company which is to set up a system of navigation and location by satellite, which in this way seems to take the lead over competing projects under gestation by industrialists or within space agencies.

Besides, Mr Henri Guillaume, French delegate for EUREKA, noted that such steps as the development of an insurance system for risky projects, under gestation in France, but also thoughts about the complementarity of the EUREKA programs with those of the EEC and the normalization philosophies are in a satisfactory state of progress.

The medium term EUREKA program (over 3 years) was also adopted in Vienna: its main axes are the continuity of the projects, an increase of the share of small and medium sized enterprises and recognition of the importance of public support measures for the projects.

EUREKA Projects with French Participation Endorsed in Vienna

EU 279 **ROSA** **Microelectronics**

OBJECT: New concept of an atomic frequency source (with rubidium) with very high stability and ultra-miniaturized. Applications in the areas of navigation, telecommunications, and metrology.

COST: 68.0 MF	FRENCH SHARE: 23.7 MF	DURATION: 5 years
LEADING COMPANIES:	CROUZET	FRANCE
	OSCILLOQUARTZ	SWITZERLAND

EU 291 **LAMA** **Materials**

OBJECT: New concept of large metallic mirrors for applications in astronomic observation and laser shooting.

COST: 81.0 MF	FRENCH SHARE: 40.5 MF	DURATION: 5 years
LEADING COMPANIES:	GIE TELAS	FRANCE
	INNSE	ITALY
	DORNIER SYSTEM GMBH	FRG

EUREKA Projects with French Participation Endorsed in Vienna (Continued)

EU 305 **CAP - Computer Assisted Production (Phase 1)** **Communications**

OBJECT: Development of a modular and integrated computer system conceived with the goal of renovating and improving the competitiveness of audiovisual production techniques by making it possible to control and manage the production.

COST: 2.6 MF	FRENCH SHARE: 1.3 MF	DURATION: 1 year
LEADING COMPANIES:	ITS	SPAIN
	EDUVISION	FRANCE

EU 309 **GINGER 2000 (Phase definition)** **Computer Science**

OBJECT: Improvement of communication among different European engineering sites for construction and public works which share the work on the same projects by developing a common language.

COST: 1.5 MF	FRENCH SHARE: 0.7 MF	DURATION: 1 year
LEADING COMPANIES:	BOUYGUES	FRANCE
	SIMON & CHRISTIANSEN	LUXEMBOURG
	KOCKS CONSULT GMBH	FRG
	PETER FRAENKEL INTER. LTD	UNITED KINGDOM

EU 313 **T.T.A.: All Terrain Vehicle (Definition Phase)** **Materials**

OBJECT: Development of an all terrain vehicle capable of going from a land environment to an aquatic environment and vice versa without preparation and without discontinuity.

COST: 13.3 MF	FRENCH SHARE: 6.0 MF	DURATION: 1 year
LEADING COMPANIES:	HAINZL	AUSTRIA
	DANFOSS	DENMARK
	GENUS INTERNATIONAL	FRANCE

EU 317 **PROFIL (Definition Phase)** **Production Techniques**

OBJECT: Conception of a flexible industrial system for the production of fermented milk products, without separation: preparation-conditioning-logistics upstream and downstream.

COST: 4.0 MF	FRENCH SHARE: 2.4 MF	DURATION: 1 year
LEADING COMPANIES:	BSN	FRANCE
	GD A.G.	FRG

EU 318 **Casting of Aluminum Pieces** **Materials**

OBJECT: Casting of aluminum pieces with high performance aluminum inserts. Application for automobile cylinder heads.

COST: 6.1 MF	FRENCH SHARE: 3.0 MF	DURATION: 2 years
LEADING COMPANIES:	MONTUPET	FRANCE
	ALUSUISSE	SWITZERLAND

EU 319 **FAMOS: FACAI** **Production Techniques**

OBJECT: Flexible assembly cell for the aeronautics industry making possible joint operations of perforation, surface preparation, application of water resistance products, and application of sealant.

COST: 40.0 MF	FRENCH SHARE: 12.0 MF	DURATION: 3 years
LEADING COMPANIES:	GMA	FRANCE
	JOBS	ITALY

EUREKA Projects with French Participation Endorsed in Vienna (Continued)

EU 321 **FAMOS: INFACT** **Production Techniques**

OBJECT: Study and development of a flexible assembly cell applied to operations in the electromechanical sector.

COST: 48.0 MF	FRENCH SHARE: 6.7 MF	DURATION: 2 years
LEADING COMPANIES:	ALCATEL ELIN	AUSTRIA
	APSIS	FRANCE
	HS ELETTRONICA PROGETTI	ITALY
	THE TRANSPUTER CENTRE	UNITED KINGDOM

EU 328 **AMADEUS** **Computer Science**

OBJECT: Implementation of an automated reservation system for various services provided by airline companies, hotels, car rental agencies... and other AMADEUS partners.

COST: 1920.0 MF	FRENCH SHARE: 480.0 MF	DURATION: 3 years
LEADING COMPANIES:	IBERIA	SPAIN
	AIR FRANCE	FRANCE
	LUFTHANSA	FRG
	SAS	SWEDEN

EU 331 **ROSAL** **Production Techniques**

OBJECT: Study and progressive development of robots for the cultivation of rose plants starting with picking, then sorting, and finally transplanting. A parallel study will be conducted on the robot/physiology appropriateness of transplating.

COST: 44.5 MF	FRENCH SHARE: 14.2 MF	DURATION: 5 years
LEADING COMPANIES:	INDUSTRIAS ALBAJAR	SPAIN
	MEILLAND	FRANCE

EU 345 **CADAM** **Biotechnology**

OBJECT: Development of new diagnostic and follow-up methods for certain types of cancer (leukemias...) and immunodeficiency illnesses (AIDS...).

COST: 61.4 MF	FRENCH SHARE: 18.6 MF	DURATION: 5 years
LEADING COMPANIES:	BIOSYS	FRANCE
	DYNAL	NORWAY

EU 351 **FAMOS: COPAC** **Production Techniques**

OBJECT: Development of a flexible production unit for cooking utensils in enamel and with non-stick coating, of various sizes and shapes. This unit will include all the operations of the process from aluminum coils or disks to completed and packaged articles. Targeted capacity: 1200 articles/hour.

COST: 15.5 MF	FRENCH SHARE: 8.4 MF	DURATION: 4 years
LEADING COMPANIES:	TEFAL	FRANCE
	ZANI PRESS	ITALY
	ABB ROBOTICS	SWEDEN
	BATTELLE	SWITZERLAND

EU 378 **BECOS (Phase 1)** **Computer Science**

OBJECT: Development of interrogation languages for data banks, natural, vocal or textual, multilingual and easily accessible for all kinds of ultimate users.

COST: 58.3 MF	FRENCH SHARE: 36.8 MF	DURATION: 5 years
LEADING COMPANIES:	SIEMENS AUSTRIA	AUSTRIA
	BULL	FRANCE
	KNOWLEDGE	GREECE

EUREKA Projects with French Participation Endorsed in Vienna (Continued)

EU 380 **LASFLEUR** **Laser**

OBJECT: Determination of vegetation covers at a distance through teledetection of the chlorophyl fluorescence induced by lasers. Application for following up on the status of the vegetation of cultures or of forests in order to determine their nature.

COST: 41.8 MF	FRENCH SHARE: 27.9 MF	DURATION: 3 years
LEADING COMPANIES:	ARP	FRANCE
	DFVLR	FRG

EU 384 **Purification of Biological Products** **Biomedical**

OBJECT: Development and study of coloring agents and color bases for the purification of biological products, with the use of immobilized coloring agents apparently offering the best compromise between the specificity of purification and the cost of economic exploitation.

COST: 9.4 MF	FRENCH SHARE: 4.8 MF	DURATION: 4 years
LEADING COMPANIES:	SMITHKLINE BIOLOGICALS	BELGIUM
	IBF-BIOTECNICS	FRANCE

EU 385 **VISILOG (Definition Phase)** **Computer Science**

OBJECT: Development of software and of its environment allowing access to simplified programming techniques (Logic Programming Techniques) and thus broadening the field of users untrained in computer languages.

COST: 10.6 MF	FRENCH SHARE: 6.0 MF	DURATION: 1 year
LEADING COMPANIES:	BULL	FRANCE
	ICL	UNITED KINGDOM

EU 386 **Cydia Pomonella G.V.** **Biotechnology**

OBJECT: Development of technologies for the production, formulation and field testing of microorganisms such as biopesticides. These technologies, which respect the environment, will also have to be economically profitable.

COST: 6.4 MF	FRENCH SHARE: 3.2 MF	DURATION: 3 years
LEADING COMPANIES:	CALLIOPE	FRANCE
	AGC	UNITED KINGDOM

EU 387 **LOCSTAR (Definition Phase)** **Transportation**

OBJECT: Establishment of a limited company (Locstar) for the purpose of developing, exploiting and marketing a service of mobile radio direction finding and common carriers by very high capacity satellite aimed at a complementary gap in the Argos system.

COST: 20.0 MF	FRENCH SHARE: 10.0 MF	DURATION: 1 year
LEADING COMPANIES:	LOCSTAR	FRANCE

EU 388 **REMIE** **Materials**

OBJECT: Adjustment and development of an electric insulating mineral coating on electric base. This insulation layer is intended to receive resistant circuits in thin layers with the goal of creating heating elements to be inserted into electrical household equipment, in conformity with the prevailing standards.

COST: 7.4 MF	FRENCH SHARE: 3.6 MF	DURATION: 3 years
LEADING COMPANIES:	EMAIL BRUGGE	BELGIUM
	TEFAL	FRANCE

EUREKA Projects with French Participation Endorsed in Vienna (Continued)

EU 389	**IRENA (Definition Phase)**	**Computer Science**

OBJECT: Development of a software environment for the engineering of value added distribution systems (Value Added Distributed Systems) applicable in various industrial areas.

COST: 10.9 MF	FRENCH SHARE: 4.4 MF	DURATION: 1 year
LEADING COMPANIES:	ALCATEL SESA	SPAIN
	SLIGOS	FRANCE
	PRISMA	ITALY
	TELES	FRG

EU 394	**Surge Protectors**	**Ocean**

OBJECT: Development and production of surge protectors consisting of metal slabs, attached to batteries stuck in the ground, following a line parallel to the coast line. This new concept of marine infrastructure is intended to maintain the integrity of the coastal area, and more specifically of the beaches.

COST: 235.3 MF	FRENCH SHARE: 120.0 MF	DURATION: 5 years
LEADING COMPANIES:	FERROVIAL	SPAIN
	CFEM INDUSTRIES	FRANCE

EU 398	**PROJAM**	**Production Techniques**

OBJECT: Automation and robotization of all the operations related to the handling of the transferring, palletizing, depalletizing, and removing from the mold of hams.

COST: 15.7 MF	FRENCH SHARE: 4.4 MF	DURATION: 2 years
LEADING COMPANIES:	CAMPOFRIO	SPAIN
	TECNAL	FRANCE

EU 399	**FAMOS: FAST**	**Production Techniques**

OBJECT: Study and development of a vehicle guided by wire within the framework of an automatic and flexible assembly unit for mini toy vehicles. The manufacturing line is built around a circuit which feeds various assembly posts, connected by mobile automatically controlled vehicles.

COST: 11.2 MF	FRENCH SHARE: 2.5 MF	DURATION: 2 years
LEADING COMPANIES:	FEMSA-BOSCH	SPAIN
	SINFOR AUTOMATION	FRANCE

EC Agreement on French, Italian Aid to EUREKA Discussed

National Aid Approved

89AN0349 Brussels EUROPE in English 23 Sep 89 pp 13-14

[Report: "Research Aid: Details of National Aid Approved by the European Commission, Aimed at Allowing for Participation of French and Italian Companies in EUREKA Projects"]

[Text] In continuing its consistent policy of adopting a favourable position in principle towards research aid as long as it does not distort competition, the European Commission has approved two further series of national aid to facilitate the participation of companies in EUREKA projects. These concern aid from France and Italy; here are the details:

1. France

The Commission has decided to approve a series of aid granted by the French Government to companies which participate in EUREKA 13 projects (Carmat 2000), EUREKA 18 (AMR—Advanced Mobile Robot), EUREKA 21 (EAST—EUREKA Advanced Software Technology) and EUREKA 55 (Carminat). Moreover, the aid granted to participants in projects EUREKA 43 (EUREKA Software Factory) and EUREKA 95 (HDTV—High-Definition Television), destined for the realisation of important projects of European interest, was approved based on Article 92.3.b.

Two projects (EUREKA 13 and 18) are aided by the Research and Technology Fund (RTF), three others (EUREKA 20, 43 and 95) by support for the Electronic Subsidiary managed by the Office of the Communications and Services Industries (SERICS) at the Ministry of Industry and Land Management. Finally, the Carminat project is jointly supported by the RTF, SERICS and the French Agency for Energy Control (AFME).

For the Carmat 2000 project in the area of automobile structures from new materials, the company GIE PSA Studies and Projects has received a subsidy of ECU

13.18 million representing 35 percent of its costs for the project feasibility study alone.

The RTF subsidies at present planned for the advanced mobile robot project for protection and civil defence amount to ECU 1.83 million, of which: ECU 1.2 million for Matra—19 percent of its participation costs in the definition phase and 35 percent in the first part of the following phase; ECU 0.3 million to Framatome; ECU 0.33 million for Technicatome, i.e., 35 percent of their first set of costs during this first development phase.

The French Society for Software Engineering has received, for its participation in the EAST project, an advance, reimbursable without interest, amounting to ECU 22.05 million, the intensity of which, in CSE (Crude Subsidy Equivalent), will reach a maximum of 45 percent in the case of the project's failure.

The intensity in CSE of subsidies granted by SERICS for the EUREKA Software Factory project reach 35 percent in the definition phase, as well as for the first part of the following phase. These subsidies, totalling ECU 14.34 million, benefit the companies Cap Sogeti, Sema Metra and Matra, as well as INRIA [National Institute for Research on Information Science and Automation] (only in the development phase). The project, which is of great strategic importance at the European level, has the aim of defining a reference architecture for a model of software factory which is highly productive and flexible.

The Carminat project, which complements the DRIVE (Dedicated Road Infrastructure for Vehicle Safety) Community programme in the area of information technologies applied to the improvement of the safety and effectiveness of road transport, has already received subsidies totalling ECU 5.25 million. It is foreseen that this aid will cover from 30 to 35 percent (gross) of the participation costs for GIE Regienov Renault Research and Innovation, which are estimated at ECU 44 million for the whole project.

For the HDTV project, the companies Thomson, RTIC, Oceanic, CCETT, Radiotechnique and Angenieux have received a subsidy of ECU 37 million covering 45 percent (CSE) of costs for their participation in the project.

The Commission has examined this aid with respect to the measures contained in Article 92 of the Treaty and in line with the orientations set out in the Community Encadrement for State Aid to R&D. It in particular took account of: the need for funded research; the risks inherent in projects; their distance from the market and the links they have with ongoing Community programmes.

The Commission has invited the French Government to notify it as soon as possible of the further aid which it wants to grant for the continuation of certain projects, in particular Carmat 2000, Carminat, AMR and ESF.

2. Italy

The Commission has decided to approve national aid for Italian participation in a EUREKA project intended to develop new flexibly automated assembly lines oriented towards small and medium-sized products manufactured in large series. The Italian share of the project amounts to 2,662 million lire (about ECU 1.7 million) and covers only basic research. The Commission takes note that under law N.22/87, Mesarteam Spa will receive an amount of 1,331 million lire under the form of a grant amounting to 50 percent of the total cost.

The Commission has also approved national aid for the Italian participation in a EUREKA project intended to develop mineral membranes and processes for separating biological fermentation products. The Italian share of the project amounts to 11 billion lire (about ECU 7.2 million) and covers both basic and applied R&D. The Commission takes note that under law N.22/87 Farmitalia Carlo Erba SRL, a Montedison subsidiary, will receive an amount of 4,737 million lire under the form of a grant for a total aid intensity of 43 percent.

The Commission considers that the present research will help improve the extraction and purification of the products obtained by fermentation, thus leading to important cost reductions and environmental improvements.

The Commission has also decided to approve national aid for the Italian participation in a EUREKA project intended to develop expert systems for predictive studies and operational follow-up for safety, availability, reliability and maintainability analysis of industrial sys tems, products or processes. The Italian share of the project amounts to 2,700 million lire (about ECU 1.8 million) and covers only basic research. The Commission takes note that under law 22/87 Datamat-Ingegneria dei Sistemi Spa will receive an amount of 1,027.5 million lire under the form of a grant for a total aid intensity of 38 percent.

Research Funded

90AN0007 Brussels EUROPE in English 6 Oct 89 p 10

[Article: "State Aid: European Commission Authorises Research Aid for France, Italy and Holland, particularly EUREKA Projects"]

[Text] The European Commission has given its approval to three state aids in the research field (two of which concern EUREKA), which it has examined in the context of the Community framework for state aids to research.

1. France: Prometheus Projects (EUREKA 45)

The aim of the Prometheus project is to develop electronic and computer systems for detecting obstacles ahead of a moving vehicle, which could be used for more efficient traffic management. The Commission has approved grant aid of ECU 57 million for the French

element in the research programme for the period 1986-89. The financing is provided by the Research and Technology Fund (FRT) and represents about 35 percent of the project cost. The Commission notes the links with the Community's own research programmes such as ESPRIT, RACE and DRIVE (Dedicated Road Infrastructure for Vehicle Safety in Europe). The participating organisations are Matra, PSA (Peugeot), and Renault/Regienov.

2. Italy: Assembly Pilot Plants

The EUREKA Project 203 is intended to improve assembly operations in industry, using just-in-time principles and through provisions concerning improved automated tools. The Italian share of the project is about ECU 7.8 million of the total expenditure of ECU 17.8 million. The aid amounts to 42.7 percent of eligible costs of 2,845 million lire (about ECU 2 million). The Commission has raised no objection to the aid.

3. Netherlands: Business-Related Research

The Commission has approved a Dutch scheme which is designed primarily to improve access to research for small and medium-sized companies. A total budget of HFL 9,750,000 (about ECU 4.5 million) is allocated for 1989, providing up to 50 percent of expenditure. The business-related research is carried out on a collaborative basis by association of at least six firms.

Italian Role Detailed

90AN0017 Brussels EUROPE in English 13 Oct 89 p 12

[Article: "State Aid: The Commission Authorises Aid to Italy Allowing for the Participation in a EUREKA Project in the Aeronautics Area"]

[Text] In line with its positive policy regarding aid for research, the European Commission has authorised aid for Italy allowing, in practice, for the participation of an Italian company in the EUREKA Pragramme "EU 137 Eurofar," aimed at the development of a tilt-rotor aircraft able to take off and land like a helicopter. Italy is taking part in this project via ECU 9.1 million, i.e. almost 14,000 billion lire, covering the definition phase of the project. The aid consists of subsidies worth 5.5 billion (39 percent of the cost) for the Agusta company. The interest of the research resides in the fact of the creation of an instrument which combines the vertical take-off possibilities of the helicopter with the speed of airplane-type cruising.

EC Research Council Assesses Framework Program

Compromise on Financing Sought

90AN0028 Brussels EUROPE in English 18 Oct 89 pp 5-6

[Report: "Research Council: Ministers Progressing Toward a Compromise on Financing of the 1990-1994 Framework Programme—Wide Consensus on Programme's Essential Content"]

[Text] The EC Research Council, meeting today in Luxembourg with Mr Hubert Curien, the French minister for research and technology, in the chair, and in the presence of European Commission Vice President Mr Pandolfi, devoted most of its session to the Framework Programme for Community R&D Actions (1990-1994). The objective is to define political guidelines concerning: the scientific and technical content of the Framework Programme; the institutional problems linked to its adoption and that of the specific programmes that will result from it; financing; and the future role of third countries, notably from EFTA [European Free-Trade Association], which wish to take part in the Programme. The French Presidency believes that the ministerial guidelines should enable the permanent representatives to later prepare a formal Council decision to be adopted at its session of 15 December 1989.

During the morning session, after approving its common position on a specific programme in the field of agriculture, the Council mostly reviewed the decisionmaking procedure to be used for the adoption of the framework programme and of the specific programmes.

The Commission proposes a dual financial decision concerning the Framework Programme, namely:

- A unanimous decision, in accordance with the Single Act, concerning the adoption of the Framework Programme, which establishes a research strategy for the coming five years and includes an estimate of the funds required for that period (ECU 7,700 million according to the Commission). In order to abide by the interinstitutional agreement, the estimated amounts for 1990-92 have been fixed at some ECU 2,700 million;
- As soon as the new interinstitutional agreement is signed, the Council should take a new unanimous decision which validates, for 1993-1994, its earlier decision, taking account of the new financial prospects offered by a new interinstitutional agreement to be negotiated for the period after 1992.

This solution is, however, unacceptable for the British delegation, which not only considers that the amounts mentioned by the European Commission are much too high, but would also like the decision in principle on the five-year Framework Programme not to include any figures for the post-1992 period.

A great majority of the member states, with the FRG in the lead, consider nevertheless, together with Mr Pandolfi, that the planning process of the research strategy envisaged by the Framework Programme cannot proceed without data, even of an indicative nature, extending beyond 1992 and covering the whole five-year period.

The Dutch delegation, for its part, submitted a compromise solution, which bases the revision of the Framework Programme at the end of 1992 on a real assessment of ongoing activities, which means that certain successful activities might be increased, while others would be progressively phased out. For 1993-1994, a substantial financial reserve should thus be set aside (to be decided unanimously) which should be used to strengthen the successful activities of the Framework Programme or to initiate new ones. In 1989, an overall financial budget would be decided for 1993-1994 which would fall inside the limits of a new interinstitutional agreement and, in 1992, a decision (also unanimous) would be made concerning the budget to strengthen ongoing activities and enabling the initiation of new ones. This system would be characterised by an ascending bell-shaped spending curve until the end of 1992, and a provisionally declining one from that date, with the understanding that it might become ascending again, depending on the assessment of ongoing programmes and new programmes, for which the financial reserve would be used.

While waiting for the drafting of conclusions on that topic, Mr Pandolfi made a presentation concerning the scientific and technical content of the Framework Programme (illustrated by a Commission working document), justifying notably the reduction to six main areas of the activities contemplated, while the current programme includes 37 specific programmes. This tightening-up of the new Framework Programme was welcomed by most delegations, but it seems that the final decision will represent a medium term between the two extremes.

The question will be examined on the basis of a new working document to be drawn up with CREST [Scientific and Technical Research Committee], which will also try to take into account the many comments on the content of the Framework Programme made by the different delegations in terms of their particular needs, the small countries obviously pleading for a higher number of specific programmes, while those countries having a large R&D infrastructure insist, with the Commission, on the need to ensure the excellence of the programmes.

Questions on active participation by EFTA countries in the Framework Programme and on comitology were also raised, without concrete conclusions being reached in this phase of the discussion.

Returning to the decision-making process, notably from the budgetary standpoint, the Presidency presented draft conclusions espousing to a great extent the Dutch proposal.

United Kingdom, Netherlands Do Not Accept Draft Conclusions Proposed by Presidency

The Presidency's proposal included the following essential elements: a) a commitment to adopt the Framework Programme on 15 December; and b) the subdivision of the credits into three parts: ECU 2,700 million for 1990-1992; an amount covering the period 1993-1994 to be specified unanimously after the conclusion of a new interinstitutional agreement; and a reserve.

The British and Dutch delegations could not accept this compromise, which was therefore submitted to the permanent representatives as the basis of discussion for subsequent Council decisions.

'Substantial' Progress Reported

90AN0028 Brussels EUROPE in English 19 Oct 89 p 7

[Report: "Research Council: The Twelve Have Made Progress Toward an Agreement in Principle on the Third Framework Programme, Despite the UK's Reservations"]

[Text] Tuesday's Research Council was an "interim but nevertheless important" Council session on the way toward the adoption of the 1990-1994 Framework Programme. Even if it finally failed to reach unanimous agreement on the crucial problem of the decisionmaking and budgetary procedures, substantial progress was made concerning the preparation of the session scheduled for 15 December, which should result in the drafting, at unanimity, of the "common position" on this third research Framework Programme. This is, in any case, what the French Presidency continues to hope, at the end of a rather laborious debate aimed at securing the Twelve's agreement on draft Council conclusions presented by the same Presidency. Here is the full text of these conclusions:

1. The Council

- confirms its agreement in principle for a third Framework Programme of five years' duration;
- agrees that this programme will be subject to a mid-term revision in 1992;
- will decide at its next session, in the light of the proposed programme and the breakdown for the period 1990-1992, the financial means in relation to the whole of the five-year period.

2. The financial means will be broken down as follows:

- one part representing the part estimated necessary for the 1990-1992 period. This part can already be evaluated at ECU 2,700 million;
- one part representing the financial envelope necessary for ensuring during the period 1993-1994 the continuity of actions undertaken during the course of the preceding period. After evaluation, this amount will be released unanimously by the Council after the conclusion of a new interinstitutional agreement and at the latest before the end of 1992;
- one part, which cannot exceed (x) [as published], to reinforce existing actions or to reorientate them and to meet new needs. The definitive amount will be decided unanimously by the Council in 1992 after an evaluation of the second Framework Programme and of the execution of the Third Framework Programme

and will respect any future interinstitutional agreement. [end of text of Council statement]

Despite a sustained effort of the Presidency and of a large majority of the delegations, it proved impossible to secure the UK's vote. The British delegation was prepared to accept the subdivision into three parts of the funds deemed necessary for the implementation of the Framework Programme, but remained opposed, at that stage, to any determination of a global commitment for the five-year period as a whole. Refusing to turn the Council into a drafting committee, the Presidency, with the agreement of at least 10 member states (the Dutch opposition to the conclusions, which were still largely inspired by the Dutch delegation's own compromise proposal, was less absolute) forwarded the text as the Presidency's conclusions to the Permanent Representatives. Answering the wishes expressed by the majority concerning the participation of EFTA countries in the Framework Programme, the Commission will rapidly present a factual analysis of what was done in the past concerning the participation of third countries in Community research efforts. This report will also include a presentation of the different possible alternatives which would enable EFTA [Europen Free-Trade Association) countries to fully take part in the Framework Programme concerning their financial contribution and, as the case may be, the possibility of influencing decisions and the programme's overall management. This last possibility raises nevertheless quite sensitive institutional problems, since the Framework Programme is essentially a Community venture. As regards the scientific and technical content of the programme (whose president is Mr Fasella, director general at the Commission), the CREST [Scientific and Technical Research Committee] will present as soon as possible, in liaison with the Presidency, a detailed list of the various concrete actions envisaged or that may be envisaged within the six main strategic orientations written into the Framework Programme.

EC: Revision of Framework Program

Introduction

36980004 Luxembourg OFFICIAL JOURNAL OF THE EUROPEAN COMMUNITIES COM (89), 397 in English 23 Sep 89

[Proposal From the Commission to the Council Concerning the Framework Program of R&D (1990-1994)]

[Text]

The Council of the European Communities,

Having regard to the Treaty establishing the European Economic Community, and in particular Article 130q (1) thereof,

Having regard to the Treaty establishing the European Atomic Energy Community, and in particular Article 7 thereof,

Having regard to the proposal from the Commission,

Having regard to the opinion of the European Parliament,

Having regard to the opinion of the Economic and Social Committee,

Whereas the Single European Act incorporated a Title VI (Articles 130f to 130q) into the EEC Treaty; whereas that Title constitutes the new legal basis for Community activities in the field of research and technological development; whereas, in particular, Article 130f lays down that the Community's aim is to strengthen the scientific and technological basis of European industry and to encourage it to become more competitive at international level; whereas, in order to achieve this, the Community is encouraging companies, including small and medium-sized undertakings, research centres and universities in their research and technological development activities and is supporting them through appropriate actions;

Whereas, on the basis of Article 130i, all Community activities in this field are set out in a multiannual framework programme;

Whereas, following an initial framework programme for the period 1984 to 1987, a second framework programme for the period 1987 to 1991 was adopted by the Council Decision 87/516/Euratom, EEC([1]) and is in the process of being implemented;

Whereas, pursuant to Article 4 of the abovementioned Decision, the Commission examined the state of implementation of the second framework programme, in particular through an evaluation report prepared by a group of independent experts;

Whereas, in view of the rapid pace of technological development, new economic challenges which the Community must meet, the increased level of global competition and the need to keep in view the horizon beyond 1992, Community activities in the field of research and technological development must be intensified and made more complete; whereas, in the light of these factors, a new framework programme should be adopted for the period 1990 to 1994 in association with the current framework programme 1987 to 1991;

Whereas the Community's activities must be based on the principle of subsidiarity, and whereas the Community's activities in the field of research and technological development must thus provide added value in relation to activities carried out at national level;

Whereas the strengthening of research and technological development policy must constitute an element of the harmonious development and cohesion of the Community;

Whereas it is necessary to retain the pre-competitive nature of Community research and technological development and at the same time the process of technological

progress requires a continuum of interlinked activities, ranging from basic research to the demonstration of the applications of new technologies;

Whereas Community research and technological development activities should incorporate a prenormative dimension in order to guarantee the scientific and technical basis necessary to establish adequate norms and standards; and whereas such an approach is likely to facilitate the completion of the single market and to provide a response to the Community's increased responsibilities in the fields of environment, health and safety;

Whereas the Joint Research Centre is called on to contribute to the implementation of the framework programme in those fields in which an impartial and independent expert opinion is required for the benefit of all Community policies;

Whereas the dissemination and exploitation of the results of research and technological development activities are essential elements in the process of innovation, in particular for small and medium-sized undertakings, and whereas, for this reason, a global initiative should be undertaken which will apply to all activities in the field of research and technological development;

Whereas a new initiative should be launched to improve the mobility of young researchers at post-graduate level, relying on networks of centres of excellence throughout the Community;

Whereas efforts should be focused on a limited number of activities and specific programmes corresponding to the strategic priorities laid down in the framework programme;

Whereas the framework programme is implemented through specific programmes and whereas, furthermore, decisions may be taken on supplementary programmes within the meaning of Article 130l, participation within the meaning of Article 130m and cooperation with third countries or international organizations within the meaning of Article 130n;

Whereas the Community's involvement in Eureka projects which fit in with activities downstream of the Community's research and technological development strategy should be increased by means of appropriate instruments and the interface between the framework programme and European cooperation activities in the field of scientific and technical research (COST) should be improved, in accordance with Articles 130m and 130n;

Whereas it is necessary to make an estimate of the Community financial means necessary for the realization of the research and development activities envisaged, in accordance with Article 130i(1) of the EEC Treaty; whereas this amount is entered in the financial perspective included in the Inter-institutional Agreement of 29 June1988([1]) for the years 1990 to 1992; whereas the item 'IMPs and research' of the abovementioned perspective allows the retention of a sum of about ECU 2 400 million; whereas as a consequence of the annual technical adjustments provided for in the Agreement, the working assumption has been made that this amount will be about ECU 2 700 million;

Whereas it is appropriate to estimate the amount required for the implementation of the framework programme in 1993 and 1994, which, with regard to its realization in financial terms, shall comply with the budgetary discipline agreed upon for these years in a future agreement, taking as its basis the amount provided for the final year of application of the current Agreement;

Whereas the funds effectively available for the execution of the framework programme shall be determined according to the budgetary procedure in line with the abovementioned agreements;

Whereas it will be possible for new financial instruments drawing on market resources to be developed outside the framework programme but related to it, in order to facilitate exploitation of the results of research and technological development programmes;

Whereas the Commission, in discharging its responsibilities, undertakes to improve the efficiency of programme management, in particular by implementing an advanced monitoring system and decentralized procedures at the project level;

Whereas the Scientific and Technical Research Committee (CREST) has been consulted,

HAS DECIDED AS FOLLOWS:

[Final Decision Adopted]

Article 1

1. This framework programme for Community activities in the field of research and technological development, hereinafter referred to as the 'third framework programme', shall cover the period 1990 to 1994. The provisions laid down for specific programmes adopted in the context of Decision 87/516/Euratom, EEC concerning the framework programme for 1987 to 1991 shall remain in force.

2. The third framework programme shall provide for six activities grouped as follows:

Diffusion technologies

1. Information and communications technologies;

2. Industrial and materials technologies.

Management of natural resources

3. Environment;

4. Life sciences and technologies;

5. Energy.

Management of intellectual resources

6. Human capital and mobility.

3. Without prejudice to the amount of ECU 3 125 million deemed necessary in respect of the framework programme for 1987 to 1991 which it will be possible to enter in the budget from 1990 onwards, the amount of Community expenditure deemed necessary for the execution of the activities envisaged by the present Decision shall be ECU 7 700 million. Of this amount, ECU 2 700 million are estimated to be necessary for the execution of the activities envisaged during 1990, 1991 and 1992 and ECU 5 000 million for the implementation of the activities envisaged during the years 1993 and 1994. The budgetary authority shall determine the available funds for each year.

4. The breakdown of the amount deemed necessary for the period 1990 to 1994 between the six activities referred to in paragraph 2 is set out in Annex I.

5. The activities referred to in paragraph 2 and their scientific and technical objectives are described in Annex II.

Article 2

1. The third framework programme shall be implemented through specific programmes in accordance with Articles 130k and 130p of the Treaty, covering each of the areas referred to in Article 1 (2).

2. For the implementation of the specific programmes, decisions may be taken on supplementary programmes within the meaning of Article 130l of the Treaty, on participation within the meaning of Article 130m, and on cooperation within the meaning of Article 130n.

3. The amounts deemed necessary for the implementation of each specific programme shall be the subject of two Council decisions, covering the periods 1990 to 1992 and 1993 to 1994 respectively.

Article 3

The detailed rules for financial participation by the Communities in the third framework programme as a whole shall be those provided for in Title VII of the Financial Regulation of 21 December 1977 applicable to the general budget of the European Communities, without prejudice to the charging to the budget of any contributions from the Communities to supplementary programmes or to national or multinational activities or projects.

Article 4

The financing of activities related to the dissemination and exploitation of the results of the specific programmes shall be brought about, in the context of coherent management, by bringing together sums allocated to these activities according to a percentage to be determined for each specific programme.

Article 5

During the third year of execution of the third framework programme the Commission shall assess its progress. It shall examine, in particular, whether the objectives, priorities, activities envisaged, and financial resources are still appropriate to the changing situation. In the light of this review, as far as is necessary, it shall make proposals for the revision of the framework programme.

Annex I: Budget Breakdown

36980004 Luxembourg OFFICIAL JOURNAL OF THE EUROPEAN COMMUNITIES COM (89), 397 in English 23 Sep 89

[Text] Framework programme of Community activities in the field of research and technological development (1990 to 1994)

Breakdown of the amount deemed necessary:

	(in millions of ecus)
I. *Enabling technologies*	
1. Information and communications technologies	3 000
2. Industrial and materials technologies	1 200
II. *Management of natural resources*	
3. Environment	700
4. Life sciences and technologies	1 000
5. Energy	1 100
III. *Management of intellectual resources*	
6. Human capital and mobility	700
	Total 7 700

Annex II: Activities

36980004 Luxembourg OFFICIAL JOURNAL OF THE EUROPEAN COMMUNITIES COM (89), 397 in English 23 Sep 89

[Text] The third framework programme (1990 to 1994) defines new objectives for giving an innovatory push to Community action. The orientations defined in the 1987 to 1991 framework programme remain in force in the implementation of the specific programmes, where an element of continuity is required.

The choice of scientific and technical objectives rests on the principle of community added value. This principle, and the exercise of selectivity which results, are of vital importance for the efficient use of the limited funds at the Community's disposal. The modification of industrial attitudes towards further transnational initiatives; replying to the essential challenges of industrial competitiveness; implanting European attitudes in the training

of young researchers—these are the criteria that have guided the selection of objectives listed in the current Annex.

As concerns the preferred means of action, the shared-cost action remains the principal instrument. In those cases where coordination of existing research at the national level is the predominant aspect, concerted action will be used.

The Joint Research Centre participates in the implementation of the framework programme. A new emphasis will be given to this participation by reinforcing research with a prenormative character in the area of industrial and materials technologies; by a reorientation of research on nuclear safety; by the reinforcement of activities linked to the environment and industrial risks; and by a new emphasis on technological forecasting. The financing of JRC research activities relevant to the framework programme will be brought about by bringing together funds available from the sums allocated to the specific programmes.

The Council shall define the detailed arrangements for the dissemination of knowledge resulting from the specific programmes. This requires general action and a unified management within the Commission services to achieve coherence. In particular, this management has to provide for diffusion of results through publications as well as by computerized means according to common standards and protocols, the adaptation of industrial and intellectual property rules, innovation transfer and the exploitation of results within the Community. The financing of these activities is achieved by grouping funds deducted from the sums allocated to the specific programmes.

In strict accordance with the guiding character given to the framework programme by the Treaty, the following paragraphs make reference to the strategic elements of the 1990 to 1994 framework programme.

I. Enabling Technologies

36980004 Luxembourg OFFICIAL JOURNAL OF THE EUROPEAN COMMUNITIES COM (89), 397 in English 23 Sep 89

[Text]

1. Information and Communications Technologies

The interaction between information and communications technologies, the increased requirements of users and the necessity to constitute a real nerve system for the single European area lead to a re-orientation of efforts along three main lines, while preserving the synergies required for subjects of great Community interest such as high-definition television.

A. *Information technologies*

Apart from the research produced within the Esprit Programme, re-oriented towards the new generation of technologies, laying more stress on prototypes and multi-supplier and distributed systems, new activities will receive priority in the following areas.

—Microelectronics

The objective is to contribute to the creation of a European manufacturing capability for advanced products, in particular integrated circuits in conjunction with the JESSI project. It is crucial to maintain the skills necessary to ensure the survival of the European electronics industry, associating the efforts of suppliers and users, and to enable potential new applications in the most advanced areas.

—Peripherals

The objective is to produce new generations which are reliable, low-cost and mass produced, taking into consideration for complex systems the most up-to-date technologies and for developing new manufacturing methods. The action should favour the appearance of new in-out and storage arrangements.

—Software

Systems and tools need to be developed enabling productivity in software production to be increased.

—IT applied to industrial engineering

The action will contribute to optimizing the use of advanced CAD/CAM systems in strategic industrial sectors.

B. *Communications technologies*

In parallel to the continued development of an integrated broadband network, the objective consists of developing intelligent, reliable and secure networks as well as new value-added and profitable services adapted to developing user needs.

Priority has also to be given to the growing demand for mobile telephony services and the integration of these services into networks. The requirements to be taken into account concern those of private life and leisure as well as professional life. To meet these needs and ensure a flexible transition between successive generations of networks, the following actions are foreseen:

—development on intelligent networks, using new techniques of information transfer, optical communications and artificial intelligence;

—mobile communications: specific issues need to be resolved, such as communication security, saturation of available frequencies, the efficient use of airborne methods of transmission, equipment miniaturization and the integration of mobile telephony into universal networks;

—image communication: building on numerical image transfer (including HDTV), research efforts are

needed to integrate image into multimedia communications and to ensure the development of allied protocols and coders-decoders;

—service engineering: work on architectures and software, realized on basic teleservices and on improved value-added services.

These actions will be accompanied by others, aimed at ensuring the reliability and the security of communications by means of developing verification and testing technologies. Finally, it will be necessary to identify the characteristics and common function of certain model services by realizing real scale experiments in advanced communications.

C. *Development of telematic systems in areas of general interest*

The realization of the large internal market is setting new requirements in the field of information exchange. At the level of public administration, faced with problems determined by the abolition of barriers and the realization of the single market, these requirements comprise topics such as the interior, justice, customs, and social security. At the level of the individual user, questions of transport, health, distance learning, environmental protection and access to rural areas predominate.

To meet these requirements, beyond the efforts being undertaken within regional or national contexts, additional Community effort is needed. This comprises the development of telematics systems combining information technologies, communications and audio-visual techniques. Industrialists, network users and suppliers throughout the Community will be encouraged to regroup around projects which meet both the requirements of economic development and social demand, thereby cementing a community of interest and spirit.

These projects, the full development of which will take place outside the framework programme, require preparatory R & D work, including language research and engineering, of a collaborative nature and including pilot experiments which will act as a catalyst and form the building blocks for future action.

2. Industrial and Materials Technologies

The objective is to contribute to the necessary rejuvenation of European manufacturing industry by developing its science base and the advanced technologies required. Technological developments will be integrated with considerations of emerging market requirements and of more severe environmental constraints. Priority will be given to major integrated projects; among these, the development of the 'clean car'.

This strategic step leads to a shift in priorities in the areas described below accompanied by the phasing out of areas such as membranes and catalysis.

—Materials

Emphasis will be placed on materials with specific properties, exploiting recent breakthroughs in the understanding of microscopic structure;

—on materials for use in extreme or unusual conditions, as well as on environmental and whole life cycle aspects of materials, including recovery and recycling.

—Design

Reducing 'design to product' lead time requires advances in the scientific and technical basis of design, including materials selection, systems analysis, design rules for manufacture, assembly, reliability and maintenance. Emphasis is placed on design-relevant enabling technologies, such as fluid dynamics, power systems and acoustics; process control, particularly aimed at 'zero-defects' products.

—Manufacturing

Improvement of the management of manufacturing operations: manufacturing practices must aim at greater efficiency, shorter implementation times, reduced 'work in progress' and unit costs, higher quality levels. Research includes mathematical modelling, adaptation of computer-aided design and manufacturing techniques, especially for small and medium-sized enterprises.

—Measurement and testing

A new emphasis on the formulation and implementation of common norms, standards and codes of practice is stimulated by the completion of the internal market. This leads to new requirements for scientific and technological know-how to provide an objective base for normative work.

II. Management of Natural Resources

36980004 Luxembourg OFFICIAL JOURNAL OF THE EUROPEAN COMMUNITIES COM (89), 397 in English 23 Sep 89

[Text]

3. Environment

The purpose is to provide the scientific knowledge and technical know-how needed by the Community to carry out its new role relating to the environment, according to Title VII of the EEC treaty. In this sector, the research activities have a common horizontal dimension of prenormative research, aimed at the preparation of environmental quality norms, safety and technical norms, methodologies for environmental impact assessment. The new actions are concerned with the following four areas.

—Participation in the Global Change Programme

The objective of the programme is to understand the processes governing environmental change and to assess the impact of human activities. European participation

will contribute to the development of research on the interaction between biogeochemical cycles, atmospheric chemistry, physical and chemical oceanography, climatic processes.

—Technologies and engineering for the environment

In addition to research on environmental monitoring, including remote sensing, a specific action will be directed at introducing techniques and engineering systems to protect and rehabilitate the environment.

—Large integrated research projects

These projects address the whole range of problems arising from major environmental issues. They may concern large coordinated campaigns, from observation and experimentation focusing on the continental or marine environment to integrated operations attacking all aspects of a regional issue.

—Research on economic and social aspects

This includes the scientific research to support the study of the legal and ethical aspects of environmental policy and management. This deals with risk assessment, perception and management; the economic evaluation of environmental impacts; the socio-economic impact of the implementation of environmental policies; and the effectiveness and consistency of laws and regulations related to environmental matters.

4. Life Sciences and Technologies

The long-term strategic objective is to contribute, in a selective and integrated way, to the development of Europe's potential for understanding and using the properties and structures of living matter.

—Basis biotechnology

Emphasis is shifted towards strengthening the science base, through research centred on understanding biological information, transformation and control systems, whilst keeping in mind the ethical implications of such work. In particular, the research actions will include genome analysis, related to genomes of representative species; neurobiology and immunology; macromolecular modelling; nutrition; testing, also in order to provide the scientific prenormative basis for Community regulations.

—Agricultural and agro-industrial research

Research in the agricultural and forestry sectors will include projects on crop and animal production, taking into account the present objectives of the common agricultural policy and of rural development; it will contribute to major interdisciplinary programmes, such as a programme aimed at finding effective remedies for desertification. Research will be developed in the field of aquaculture and fisheries. Research, development and demonstration actions will be taken beyond current activities, exploiting results from plant molecular biology and physiology research, through soil-plant interaction, to harvesting and processing. Emphasis is placed on increasing resistance of plants to adverse agents by genetic means. In the field of industrial utilization of agricultural raw materials, the strategic priority is to obtain, through chemical and biological processing, new biodegradable products and to provide clean energy sources by exploiting biomass.

—Biomedical and health research

The main focus is on new ways of tackling socially and economically relevant diseases, through concerted methodological and protocol studies in epidemiological, experimental and clinical research. For cancer, attention is shifted towards early tracing of carcinogenic factors and the development of new tests for anti-carcinogenic drugs. For AIDS, a new activity aimed at the development of control systems, including chemotherapy and vaccines will be developed.

—Life sciences and technologies for developing countries

Emphasis is placed on tropical agriculture (integrated management of agricultural resources for reducing food shortages in regions at risk whilst protecting the environment) and on tropical health research (efforts are concentrated on new steps to combat some major tropical diseases).

5. Energy

Environmental compatibility has become a key element for energy systems. Therefore the central issue of Community action in this field is shifted towards the development of clean and safe energy technologies. This is pursued in the following three areas:

—Fossil, renewable energy sources, energy utilization

A diversity of technological options is required, taking into account energy-related environmental problems such as the greenhouse effect and acid rain. The research includes the use of hydrogen and other suitable substitutes for liquid fuels in the transport sector. In-depth analysis is carried out on the concept of 'zero emission power', which is focused on electricity generation having a minimal environmental impact. Certain lines of research inconsistent with this approach are discontinued, such as research on coal liquefaction. Following recent breakthroughs in the understanding of combustion processes, and of new electrolytes and catalysts, new energy production and saving technologies will be developed.

—Nuclear fission safety

Community action will put further emphasis on the harmonization of safety approaches and thus reinforce the prenormative dimension of its research. A new impulse will be given to research on reactor safety, radioactive waste management, fuel elements, actinides and control of fissile materials. Radiation protection research will include radiation from natural and medical sources, a better definition of the risks of low radiation doses, new technologies to assess quickly the radiological consequences of nuclear accidents.

—Controlled nuclear fusion

The Jet Joint Undertaking is prolonged up to 1996, in order to achieve control of plasma in conditions close to those of the Next Step (Engineering fusion test reactor). Work for the detailed design of the Next Step as well as for new systems will be pursued. Some existing fusion devices will be phased out having completed their experimental programmes. The present keep in touch activity in inertial confinement is developed, through fundamental research on the interaction of plasma with laser light and possibly with accelerated heavy particles. Muonic and other cold fusions will be explored.

III. Management of Intellectual Resources

36980004 Luxembourg OFFICIAL JOURNAL OF THE EUROPEAN COMMUNITIES COM (89), 397 in English 23 Sep 89

[Text]

6. Human capital and mobility

The purpose is to provide the European research system with the trained human resources on which it is critically dependent and which are likely to become increasingly scarce in the years to come.

A new initiative characterized by the highest efficiency and Community added value is required. These two requisites are inherent in a major project of mobility of young researchers, at post-graduate level, in the area of the exact and natural sciences, technologies and economic science. Training at the interface between basic sciences and technological applications will be pursued.

The Community will finance the cost of training, generally for a period of two years, in centres of excellence of a country different from the country of origin. This is a Community investment in human capital, which will have pervasive effects over the whole research and technological development system and on cohesion and the redressing of intracommunity imbalances. This investment can, where necessary, be complemented by support measures in favour of networks of research training centres.

An important role in the implementation of the programme will be played by the scientific community itself, through its own institutions, particularly for the identification of networks of centres of excellence and the selection of candidates.

Companies Form Technology Transfer Network

89AN0350 Brussels EUROPE in English 22 Sep 89 p 16

[Article: "Technology: Creation of a European Network Within the Framework of SPRINT"]

[Text] Five consulting companies have decided to create a new network to improve technology transfer and the management of innovation for Community companies and universities. They want to promote collaboration between companies with complementary activities, especially in the area of transfer, licensing agreements, the elaboration of new products and processes. The five companies are: Eurodeveloppement (France) with its headquarters at the University of Valenciennes, Tracer NV (Belgium), Trade-Consulting (FRG), Secoinfo (Spain), and Michael J. Crowson & Associates (United Kingdom). The co-founding companies met during Europartnership days, which were held in Malaga, Spain. They submitted a request for the co-financing of ECU 120,000 regarding the EEC within the framework of the SPRINT (Strategic Program for Innovation and Technology Transfer) Programme.

SUPERCONDUCTIVITY

Superconductor Electromagnet Ready for Accelerator Use

90CW0006 Milan CORRIERE DELLA SERA in Italian 26 Sep 89 p 19

[Article by Lanfranco Belloni: "Superconductor Magnet for Nuclear Particles]

[Text] Located in a building with futuristic lines, adjacent to the Milan 2 complex and San Raffaele Hospital in Segrate, LASA (Laboratory of Accelerators and Applied Superconductivity), recently developed a superconductor electromagnet for a heavy ions accelerator. It is the first device of this kind in Europe, and the technical development was the product of an exclusively Italian effort.

The scientific capability came from the physicists of the National Institute of Nuclear Physics, while the technological part was handled by Europa Metalli, Ansaldo Componenti, and Zanon. This is the same high-technology trio of Italian companies that has received substantial contracts to develop magnets of the Hera accelerator machine of Hamburg.

In a particle accelerator, the function of the magnets is to force the particles to move in a circular trajectory, or, better, spiraling, from the source to the target. The LASA superconductor magnet is the main component, which recently went into operation, of a cyclotron for heavy ions that will ultimately be installed at the National Laboratory of the South, at Catania.

The weight of the magnet, including iron and coil, is some 200 tons, and the dimensions are 4 meters in diameter and 3 meters in height. The material used for the wire is an alloy of niobium and titanium, thus a superconductor material of traditional type, which operates at the temperature of about 270 degrees below zero: the temperature at which the material completely loses its electrical resistance. The use of a superconductor material makes it possible to achieve very intense magnetic fields, up to 6 tesla. Also, there is advantage to the

smaller dimensions compared with traditional magnets. In addition to the size reduction, there is also a considerable reduction in cost.

The high level achieved in use of the traditional superconductors does not imply an underrating of the future technical possibilities of the "hot" ceramic superconductor materials. However, as emphasized by the leader of the superconductor cyclotron project, Emilio Acerbi of the University of Milan, the latter are still being studied on the scientific level, and will continue to be for a long time. One cannot today place reliance on the new superconductors, which lose electrical resistance at temperatures p73 much higher than the traditional. In fact, at this time, they permit passage of minimal currents, and are of no value for applications.

Nevertheless, superconductivity remains a leading edge technology, and LASA, under the direction of Claudio Birattari of the University of Milan, is a beehive of advanced programs. After the superconductor cyclotron, which will go south, there are other application projects based on superconductivity on the program. Under consideration is a solenoid that would create very high magnetic fields, up to 19 tesla.

Another project on the launch ramp is an accelerator based on a free-electron laser. This is, so to speak, a double technological wager, since for the traditional laser expert the free-electron laser is already of itself a wager of the future. If this double wager could be won, one could go further and try for an even bigger stake: "hot" internal fusion with heavy ions, acclerated with a free-electron laser.

AEROSPACE, CIVIL AVIATION

USSR, Czechoslovakia Collaborate on TESLA RL-61 Radar System

90CW0013 Prague SLABOPROUDY OBZOR in Czech No 8, Aug 89 pp 359-361

[Article by Eng Emil Kvitek, candidate of sciences, and Eng Stanislav Sklenar, TESLA Pardubice, Research Institute for Radio Engineering at Opocinek: "TESLA RL-61 Druzhba Airport Surveillance Radar System"]

[Text] **The article describes the basic technical characteristics of the airport surveillance radar system, which came about as a result of the direct collaboration between Czechoslovak research facilities and their sister facilities in the USSR. The radar system is intended for use at commercial airports with medium and heavy traffic density.**

The RL-61 Druzhba radar system was developed by TESLA Pardubice, at the Research Institute for Radio Engineering at Opocinek in close collaboration with the VNIIRA of Leningrad. It is intended to detect aerial targets and to control air traffic in the region of the airfield. It contains a primary surveillance radar, operating in the 10-cm band, and a secondary surveillance radar, operating in accordance with the standards of the ICAO and the USSR.

Brief Characteristics

The antenna of the primary radar, with its mirror, is of the dual-beam type, with the main beam at the lower level and the auxiliary beam at the upper level. Both beams are fan-shaped and their axes are located in the vertical plane of cosec^2. The lower beam has a maximum under its elevation angle of 2.5°; the upper beam, under the angle of 5.5° in an approximate funnel position and 7.5° in the deflected position. In relationship to the main beam, the auxiliary beam is thus raised at an elevation of a few degrees so that it receives weakened echoes of ground objects, thanks to its sharp lower leading edge. This reduces the possibility for losing weak targets against the background of strong ground targets. The shape of the antenna diagram stresses targets with a great angle of elevation. This facilitates the introduction of a more effective time control of the signal level and, thus, also the suppression of weak targets, for example, of the "angel targets" which are generally found at lower altitudes.

It is possible to set arbitrary polarization for electromagnetic waves in both beams, ranging from the lineal-vertical through the circular all the way to the lineal-horizontal. Control of polarization is remote and continuous and is independent both in the main and the auxiliary beam. The antenna rotates at a constant speed of 10 or 15 rpm.

The switching of the radar signal—the signal from echoes—between the auxiliary and the principal beam is accomplished at a preselected distance. This distance is selected in such a manner as to suppress strong echoes from ground objects in the vicinity of the radar and so as to prevent loss of low-flying targets as a result of raising the upper auxiliary beam. Reception of signals over shorter distances is also influenced by the timing control of the signal level, which is independent for each of the beams.

The antenna for the secondary radar is mounted on the primary antenna. Both antennas share common motion mechanics and are mounted on a steel tower which is 6 meters or 14 meters high.

The klystron transmitter transmits a coherent signal, since it amplifies the vf signal provided by the exciter. This means that the signal has a continuous phase in its individual pulses. This obviates the need to phase the coherent oscillator, and, thus, also its imperfection, so that the suppression of echoes from nonfluctuating ground objects is improved. The klystron also makes it possible to transmit signals which are pulse-modulated. This is why the klystron transmitter is suitable for pulse compression equipment. The transmitter for the primary radar transmits a 24-$\simeq$ pulse with lineal frequency modulation within the pulse at a frequency of f_1 and follows it up with a monochromatic pulse at a frequency of f_2 which measures 1 $\simeq$. Both pulses are radiated by the lower beam. The upper beam serves only to receive echoes from short distances at a frequency of f_2, that is to say, those echoes which have arisen as a result of the reflection of the short monochromatic pulse.

Utilization of pulse compression makes it possible to lower the pulse output of the transmitter while assuring the same range. This reduces the danger of a breakdown in the microwave route and, therefore, it is not even necessary to pressurize that route. In the given case, a compression ratio of 24:1 is used, since the receiving channel of the main beam compresses the pulse from 24 $\simeq$ to 1 $\simeq$. To accomplish compression, a silicon dispersion time lag line with a surface wave is used. A similar line is also used in the transmitter for the generation of lineal frequency modulation within the pulse.

Within the receiver, the radar signal from the upper beam is switched to the lower beam at the instant which corresponds to a certain settable distance. A signal so composed is fed into the circuits of echoes from ground objects. Simultaneously, the amplitude detection AD of the signals is carried out. Both types of signals from the IPC and the AD are switched in accordance with the map selected for the given radar location in conjunction with the azimuth and the distance to the target. The map can be set with a miniature switch in 30° azimuth sectors at distance increments of 10 km each. This results in limiting the lower likelihood of identifying targets while evaluating the situation with IPC circuits, restricted to those locations where ground objects exist and where the IPC is necessary.

The IPC circuits operate by the coherent method. They process the radar signal in digital form as it originates from the analog outputs of the phase detector in an 8-bit converter. Suppression is double, that is to say, the IPC circuits operate by the triple-pulse method. Blind phases

are eliminated by quadrature channels—by processing the sine and cosine components of the signal. Blind velocities are limited by alternating eight different intervals between individual pulses. The sequence of alternation is selected in such a manner as to achieve the best balance with respect to the velocity characteristics of the IPC circuits.

The radar signal is further evaluated in a digital detector and an extractor. The digital detector transposes the analog radar signal in individual distance magnitudes to the H or L levels. Such an adjusted signal resulting from individual radar events which follow each other is evaluated by the detector using the method of a shifting window in accordance with the IPC (indication of moving targets), where selected criteria m out of n are suppressed. By selecting the hardness of this criteria, it is possible to influence the ratio between the likelihood of losing weak targets and the number of spurious undesirable targets.

The signal—the response from the aircraft—is evaluated and decoded by the standard method in the secondary radar installation.

The output from the primary and secondary radar is evaluated in a common extractor. The extractor transposes the polar coordinates of the target into rectangular ones and reports on targets with all their detected data in numerical form.

The output signals of the radar system, in analog and digital form, are fed via a special ground cable to the technical room and further to the control room where they can be displayed on any kind of suitable display unit in various operating regimes. The output signal in digital form, which contains all data regarding the identified targets, can be transmitted by any randomly selected narrow-band communication means over any distance and then again displayed.

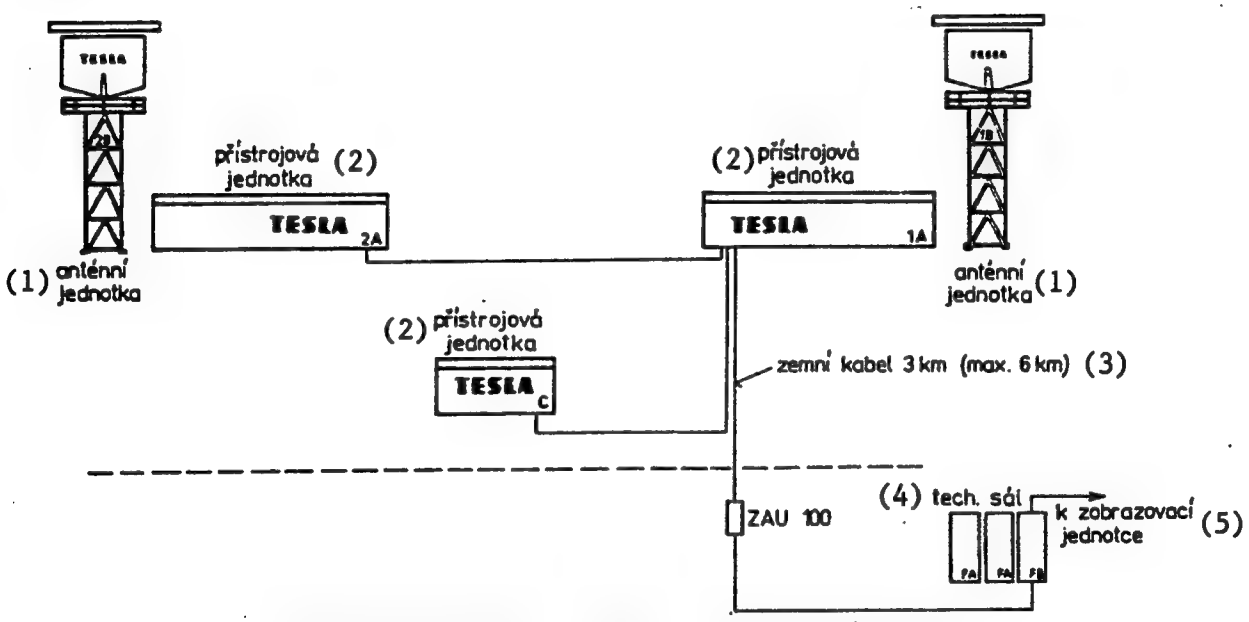

Figure 2. Composition of Model RL-61 Druzhba radar system.

Key:—1. Antenna unit—2. Instrument unit—3. Ground cable 3 km (maximum 6 km)—4. Technical room—5. To display unit

Main Technical Parameters

Item	Unit of Measure
Primary radar	
Frequency band	2700 to 2770 MHz
Dimensions of antenna mirror	5 x 3.6 m
Width of beam in horizontal plane	1.4°
Polarization—continuously settable	From vertical line through circular all the way to horizontal
Speed of antenna rotation	10 or 15 rpm
Klystron transmitter	

Main Technical Parameters (Continued)

Item	Unit of Measure
Length of transmission pulse	24 μs, frequency modulated with an elevation of Δf = 2 MHz; 1 μs at constant frequency
Nominal pulse output of transmitter	100 kw
Average repeater frequency of pulse	700 Hz
Number of repeater frequencies	8
Receiver	Dual channel, main channel has pulse compression from 24 to 1 ≃
Noise level	4.5 dB
IPC circuits	Digital with double suppression and quadrature channels
Digital detector	With a shiftable window, with selectable evaluation criteria, independent in three sectors of distance, m and n, where m = 2 through 7, n = 8
Maximum range, taking into account the repeater frequency	160 km
Minimum target distance	1.5 km
Maximum range where $P_d = 0.9$, $P_{fa} = 10^{-6}$ pertaining to a TU-134 aircraft	90 km at altitude of 1,200 m
	120 km at altitude of 3,000 m
	160 km at altitude of 6,000 m
Secondary radar	
Working ICAO frequencies	1030 MHz, 1090 MHz
Working USSR frequencies	740 MHz, 1090 MHz
Antenna length	6 m
Width of antenna beam in horizontal plane	4°
Klystron transmitter	
Pulse output of transmitter	2 kw—interrogator channel
	4 kw—suppression channel
Average repeater frequency	350 Hz
Maximum range at $p_d = 0.95$, $P_f = 10^{-6}$	90 km at altitude of 1,000 m
	120 km at altitude of 3,000 m
	160 km at altitude of 6,000 m
Maximum distance range	240 km
Azimuth information	4,096 pulses per revolution

The radar outputs are adapted for connection with a Soviet-produced Simvol D display unit or for use in a similar TESLA unit.

Characteristics of the RL-61 Druzhba System

- Main and auxiliary antenna beams with signal switching at preselected distances,
- klystron transmitter with exciter,
- pulse compression,
- digital IPC circuits,
- digital signal processing in detector and extractor,
- switching of signals from IPC and AD according to selectable map,
- output information in digital form,
- built-in secondary radar operates within ICAO and USSR standards,
- it is possible to transmit information in digital form over any narrow-band transmission device over random distances and to display this information at the other end through conventional means.

The RL-61 Druzhba radar system consists of an antenna portion with two towers housing antennas and of three instrument units. The technical room contains three cabinets of electronics. It is connected to the antenna portion by a special ground cable of the DCEKEY type which can be a maximum of 6 km long. It is possible to use a maximum of 200 meters of cable to connect the technical room with the Simvol D radar display unit, which is produced by the Soviet Union, or with a similar unit manufactured by TESLA.

COMPUTERS

Role of GDR's INQUAMESS-UPCI 1001 PC Described

23020083 East Berlin FEINGERAETETECHNIK in German No 7, Jul 89 pp 292-293

[Article by Dr D. Hofmann, U. Kaufmann, K. Gebhardt: "The INQUAMESS-UPCI 1001: Intelligent, High-Quality Measurement Equipment Using Universal Personal Computer Tools"]

[Text] The introduction of computer-aided methods in all sectors of the national economy has brought an increase in the requirements to be met by peripheral equipment; in particular, the equipment used for gathering, storage, output and transfer of measurement information must meet ever higher standards. These requirements are being met in different ways [1]:

On the one hand, the rapidly increasing integration density in the field of microelectronics makes the modern personal computer capable of an increasing number of functions, examples of which are large memories with capacities of several MB and mass storage devices with capacities of several hundred MB, plug-in cards for analog data handling, network controllers, and high-resolution color graphics controllers.

On the other hand, standard personal computers are being paired with intelligent peripherals, making available a variety of additional tasks to be performed. These peripherals include floppy disk or hard disk drives, monitors and other types of equipment for gathering measurement information and processing measurement data. So-called universal personal computer tools are the equipment of choice for gathering and outputting data [2].

The INQUAMESS-UPCI 1001, a universal personal computer tool in the Department for Scientific Instrument Design Technology at the Friedrich Schiller University in Jena, is one such flexible system [3], [4].

1. Equipment Characteristics

The INQUAMESS-UPCI 1001, due to its modular design, is easily adapted to a variety of applications. Such applications include the coupling of a variety of commercially available measurement and control devices with commercially available computers.

The devices which the INQUAMESS-UPCI comprises are as follows (Fig. 1):

The basic unit consists of the INQUAMESS-NT 10 and NT 20 power supplies which deliver -15 V, 5 V and 15 V, INQUAMESS-RV backplane wiring and the housing for standard 170 mm x 95 mm plug-in cards.

The INQUAMESS-INT 20 plug-in card is included in the basic configuration of the unit. It contains the UB 8840 single-chip microprocessor with 4 KB of EPROM, an analog input with an A/D converter at a voltage of +/- 5 V (bipolar) or 10 V (unipolar), a 16-bit binary input, a 24-bit binary output and a V.24/RS-232 C interface to the host computer.

The INQUAMESS-INKRAS 30 plug-in card drives one of the following incremental linear sensors: IKF 10, IKF 30, IKF 60, IKF 100, KMM 30 or KLM 60 manufactured by the VEB Feinmesszeugfabrik [Precision Tool Factory], Suhl, GDR. These sensors are capable of a resolution of 1 µm. The counting range is roughly 2 million µm, making the card compatible with all types of incremental sensors without the need for interrupts.

The INQUAMESS-INDAS 20 is suitable for connecting two inductive linear sensors of types 4071, 4072 or 4073 from the VEB Precision Tool Factory in Suhl for dual operation. The signals of the two sensors can be linked to one another in various ways. The achievable resolution is 1 µm.

The INQUAMESS-PIO 21 plug-in card outputs 8 bits and inputs 40 bits of binary data at the standard TTL level. This means that control signals from different processes can be output and BCD information from different display units can be accepted. Examples include control of type IKF 60 mot or IKF 100 incremental linear sensors and connection of the AE 1I, AE 1IK or AE 100 display units.

The INQUAMESS-EA 10 plug-in card inputs and outputs data which is 8 bits wide. The output data are available via relays at 0 V or with an open collector and are particularly well suited for driving power elements.

The INQUAMESS-INKRAS 30, INQUAMESS-PIO 21 and INQUAMESS-EA 10 pc-boards are used in various quantities, while it is also possible to connect several inductive sensors externally via commercially available multiplexers.

2. Program Characteristics

A powerful operating system which is open to expansion is stored in part of the available memory area. Communication between the PC and INQUAMESS-UPCI via the V.24/RS-232C interface is executed in various ways. Reliable data transmission is achieved by using checksums and protocol functions. At a data transmission rate of 4800 baud, for example, 33 measurements per second of 24 bits each on average is possible. Faster data transmission is possible if the reliability checks are omitted. Then 55 measurements per second can be achieved.

UPCI-internal and interface functions are selected from the PC level (Fig. 2).

UPCI-internal functions operate without access to the periphery.

Identification of the program version is possible using the KENN program module. In addition to the default

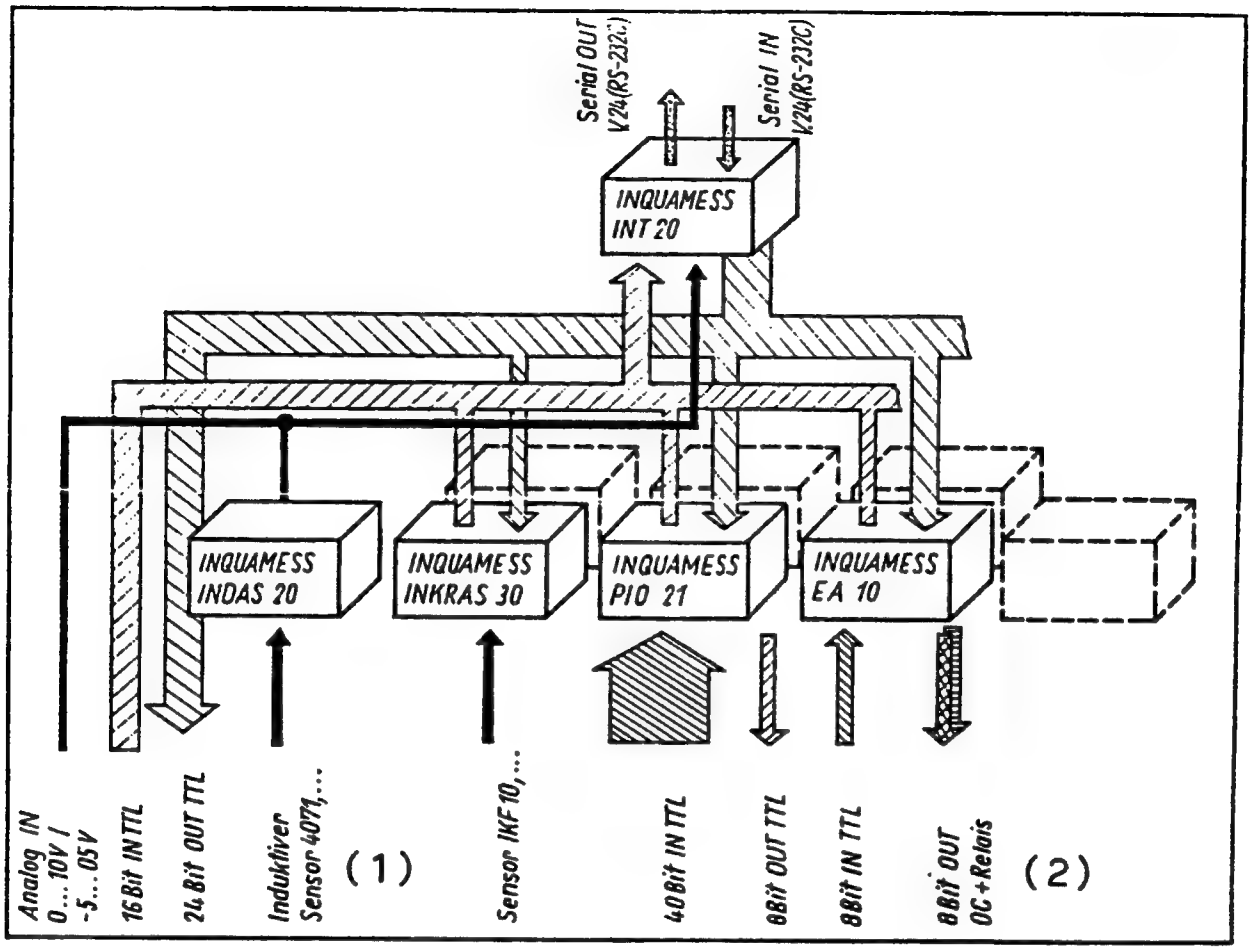

Figure 1. Equipment Modules of the INQUAMESS-UPCI 1001

Key:—1. Inductive Sensor 4071, etc.—2. OC + relay

4800 baud, all data transmission rates from 600 to 19,200 baud can be set using the BAUD program module.

BIN, BCD and ASC convert the measured values. Other program modules generate the average value, search for the maximum and minimum in a series of values and support calibration and differential measurement.

Interface functions organize the input and output of data.

The EMPF, IN 50, ADU and IN, as well as the SEND, OUT20 and OUT program modules are direct interface functions used by the INDAS, INKRAS, IMS1, IMS2, AE1I, AE100, AE101, DTM and PBM program modules for connecting special devices. INDAS and INKRAS receive measured values from the corresponding plug-in cards, IMS1 and IMS2 receive data from the internationally standardized parallel bus systems which bear the same names, and the AE1I, AE100, AE101 and DTM ensure the transfer of data from the display units which bear the same names. PBM permits control of DC motors via the INQUAMESS-PBM 10 plug-in card which is currently in development.

In addition to the operating system employed by the user to access all functions of the UPCI from the host computer, a user-specific control program can also be stored. This user program is processed on any Z8 cross-assemblers and is based on the operating system which is already implemented. Real-time operation is possible via interrupt processing.

The programming of this tool indicates data transmission and device errors caused by synchronization problems and defective components or modules.

In order for 8-bit and 16-bit master processors to communicate with the INQUAMESS-UPCI 1001 as a slave processor, routines are provided in modern programming languages such as Turbo Pascal and are incorporated as include files or as a unit in the user program. This saves the effort of programming the transmission of data between master and slave processors. All

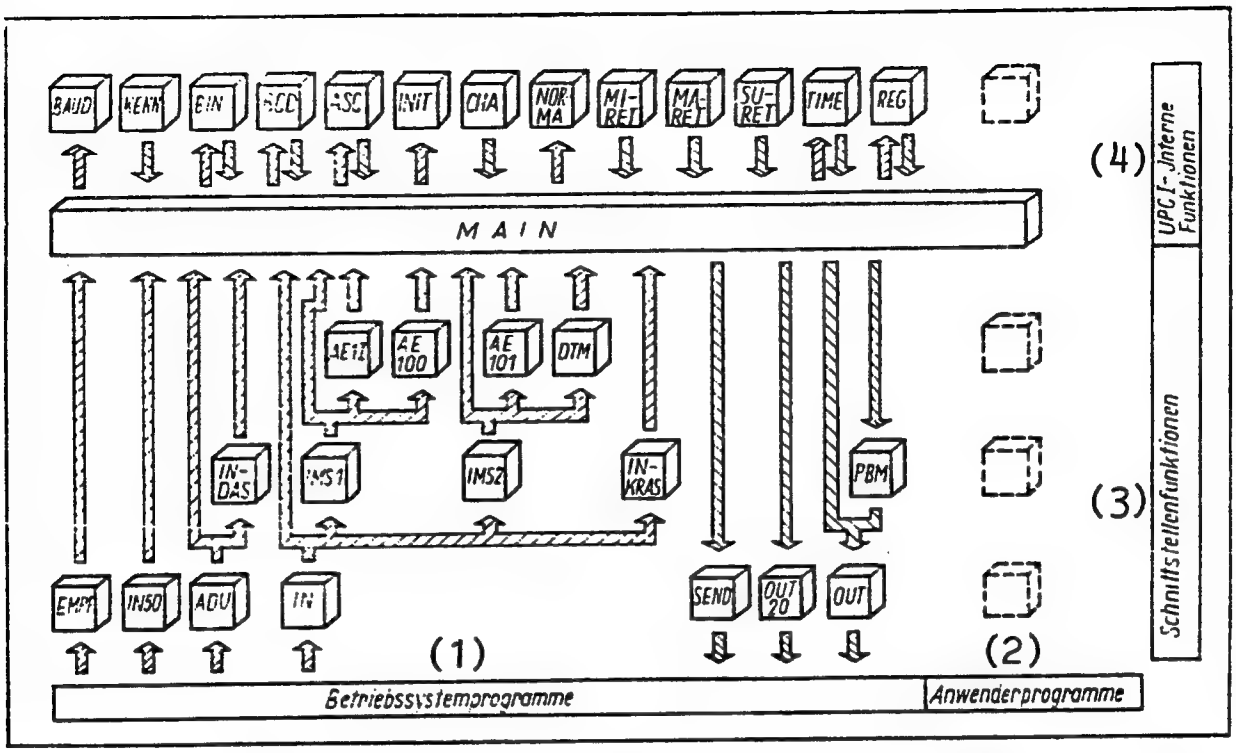

Figure 2. Programming Modules of the INQUAMESS-UPCI 1001

Key:—1. Operating System Programs—2. User Programs—3. Interface Functions—4. UPCI-Internal Functions

INQUAMESS programming is developed for the effective use of the tool described here.

3. Summary

The INQUAMESS-UPCI 1001 universal personal computer tool is a device which in view of international developments [5] meets the increased requirements of computer-aided quality assurance (CAQ) for process-related measurement and short-term control of manufacture, and has the advantage of being able to use conventional methods of measurement, computation and control for this purpose (Fig. 3). This tool has already been used successfully in several enterprises and establishments under entirely different circumstances [6]. Beginning in 1989, the combine VEB Carl Zeiss of Jena will take over the manufacture of this tool in order to satisfy the growing demand of many enterprises for high-quality, intelligent methods of measurement and control.

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RTV 2000: Basic Software for GDR's CAD/CAM Applications

23020089 East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German
No 8, Aug 89 pp 29-31

[Article by Dr. Heinrich Haberland, Reinhard Britsche, Karl-Heinz Bondick, VEB DVZ Magdeburg; Wolfgang Weiss, VEB SONNI Sonneberg; Volkmar Olbrich, VEB

Conveyer Systems "7 October," Magdeburg: "RTV 2000 Product Line for CAD/CAM Applications"]

[Text] With the development of the RTV rationalization solution for computer-aided technical preparation for production, its continuing enhancement, and successful application in various combines for more than 10 years, comprehensive expertise is available (1) through (8). A significant factor in this is the enduring cooperation of industrial firms, university facilities, and the developer collective of the DVZ [data processing center] Magdeburg in the RTV user group.

The increased availability of modern workplace-oriented computer technology opens innovative capabilities for computer support to a broad range of users.

For this, important considerations for software suppliers include continuity for users and attractiveness to the newcomer. The VEB DVZ Magdeburg is meeting these requirements on behalf of the VE Data Processing Combine Berlin with the production of RTV 2000 as flexible modern basic CAD/CAM application software which will continue to be productive over the long term.

The focus of current developmental work at the VEB DVZ Magdeburg is on enhancement of the basic software already licensed for many uses in the national economy:

- the database operating system DAFEMA (9) for support of distributed processing and for management of CAD/CAM structures,
- communications software ZNSP/TCAM, DATRA for regional remote processing networks and for integration of modern computer network technologies,
- the basic RTV solution for computer-aided technical preparation for production using workplace computer technology within the framework of a distributed data processing and data management system (Fig. 1).

In the company organizational cycle, computer-aided technical preparation for production [RTV] follows planning and production management and precedes production. RTV applications support the creation and elaboration of the records for technical documentation. The company-specific models stored in RTV form the basis for this. The results are made available in a central on-line database (preferably DAFEMA) for multipurpose use. User-computer communication and user modeling are based on the establishment and use of user-specific descriptive technical terminology.

Application Functionality

The hardware design includes the use of efficient CAD workstations and the use of centralized ESER electronic data processing for database management with data transfer. The software design implements the functions of a two-component CAD software system divided into the general basic solution and the company-specific application built on it.

Standardized customization and handling of user applications is carried out efficiently using CAD/CAM tools (technical terminology generator, technical terminology compiler, mask editor, sequence processor for determining and continuing the processing of sequences).

An expandable system design with flexible functionality is at the disposal of the user application developer (Fig. 2).

Functions of the Basic Level

- Through establishment of user-specific descriptive technical terminology, any records can be described with full complexity.
- With the description of records record organization, test rules, standard value agreements, file organization, and output patterns for monitor display and printing of records are established simultaneously.

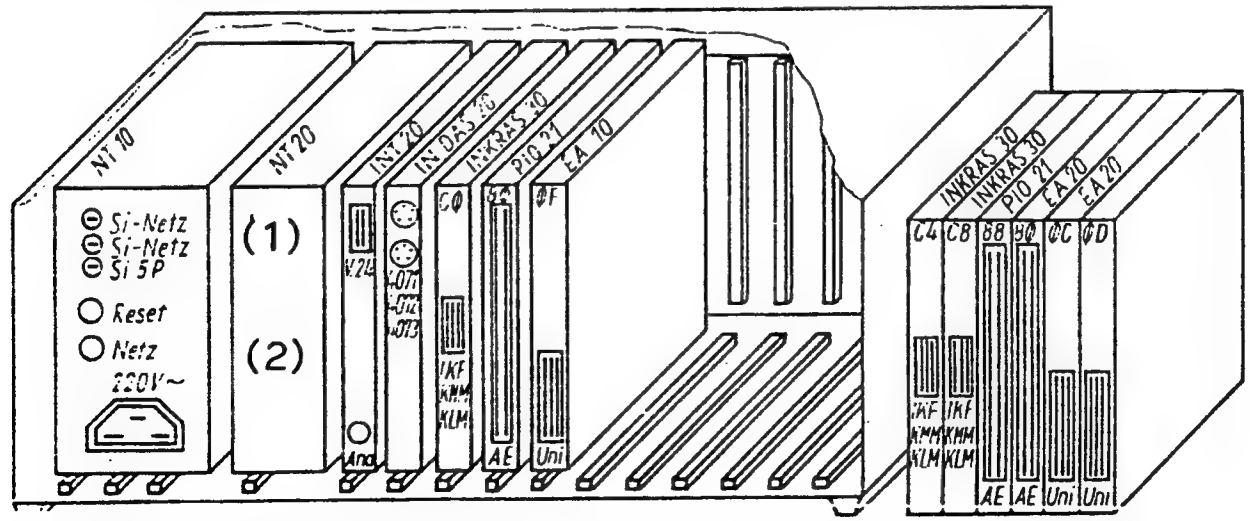
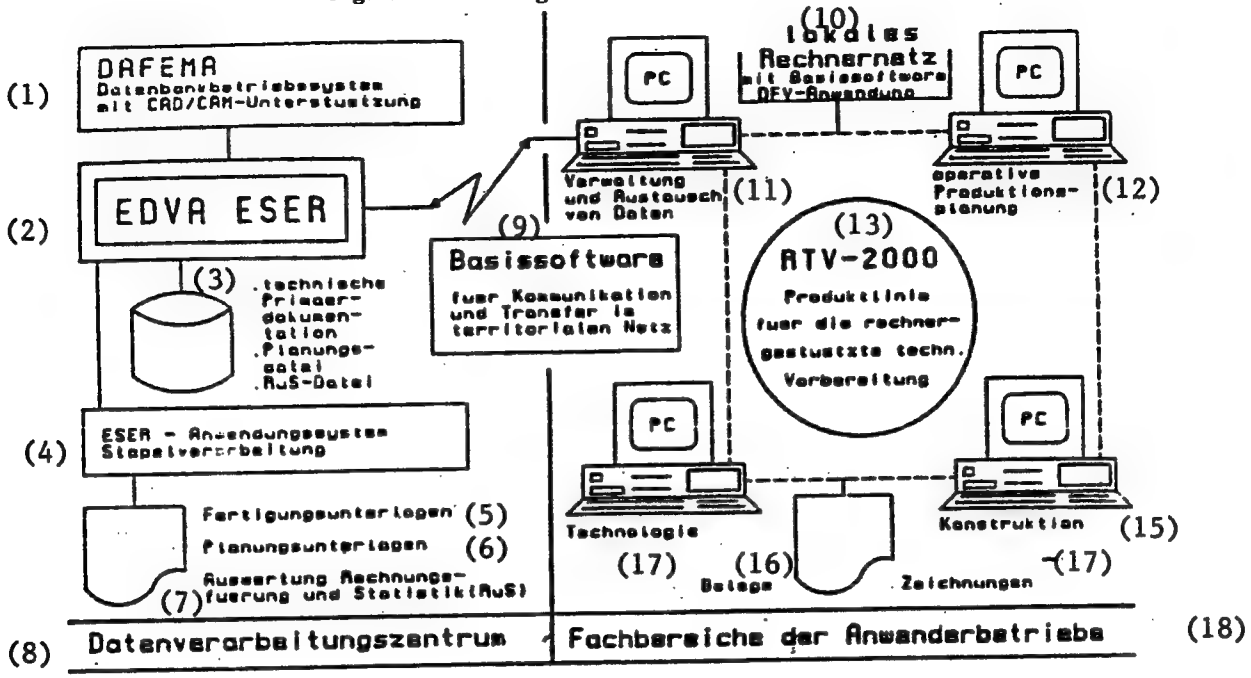


Figure 3. Configuration of the INQUAMESS-UPCI 1001

Key:—1. Signal Network—2. 220 VDC Power Supply

Figure 1 Basic Integrated CAD/CAM Software Package



Key:
1. DAFEMA database operating system with CAD/CAM support
2. EDP ESER
3. Primary technical documentation, planning files, calculation and statistical files
4. ESER Application system, batch processing
5. Production documentation
6. Planning documentation
7. Evaluation of calculation and statistics
8. DP Center
9. Basic communication and transfer software in the regional network
10. LAN with basic software remote DP application
11. Data management and exchange
12. Operational production planning
13. RTV 2000 Product line for computer-aided technical preparation
14. Technology
15. Design
16. Documentation
17. Sketches
18. Technical department of the user firm

- Building on that, the comprehensive generation of the user application takes place (screen masks, data structures, formatting).
- In addition, variable inclusion of user routines is possible (test, presetting, and calculational programs).
- The generated result provides computer-aided elaboration of the records described (capture, processing, storage, modification, evaluation, display, printing, use) simply and with efficient user support.

Logical Functions of the "Ratio" Level

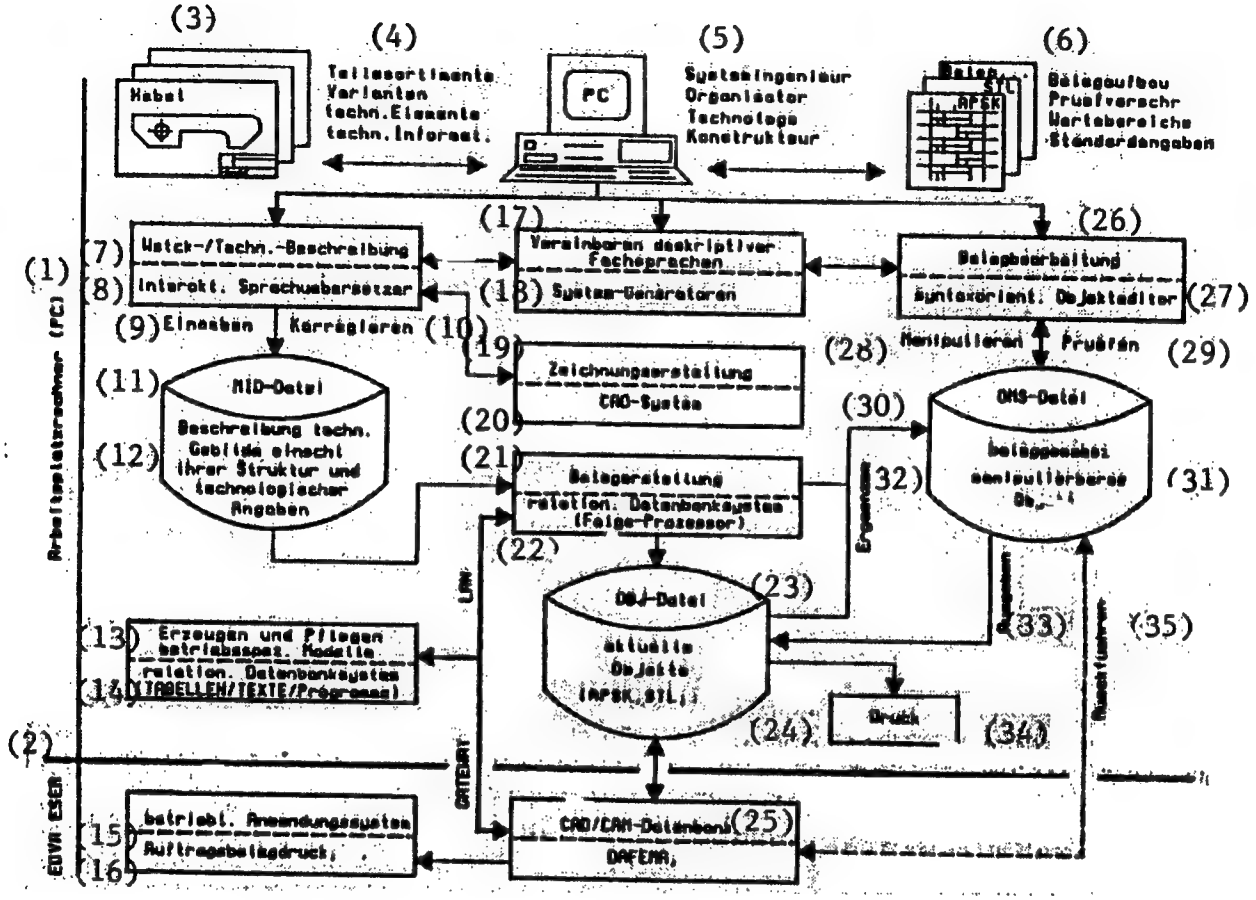
- The "ratio" level includes comprehensive enhancements of the basic level with a view toward efficient creation of records.
- After generation in the basic level, significant system components of the "ratio" level are immediately available (record structure, files, interaction structures).
- Using terminology conventions, application-specific technical terminology is supplied for tool and technology descriptions.
- The rationalization result achieved is basically determined by the level and scope of the model description which is carried out using tables, variable text procedures, and dynamic built-in user programs.
- The description and storage of design tools supports connection with the sketch generation system which is present.
- Expanding on that, computer-aided generation of records for components and individual parts is assured.

Handling

Whereas the basic level permits rapid and uncomplicated access to computer-aided operations with broad rationalization results, the "ratio" level requires, depending on the automation results desired, greater expenditures in terms of preliminary thought and preparation of the model description.

The "ratio" level may be broken down into different developmental steps, beginning with the storage of

Figure 2 Structure and Functions of RTV 2000



Key:
1. Workplace computer (PC)
2. EDP ESER
3. Switch
4. Parts catalog, variants, technical elements, technical data
5. Systems engineer, planner, technical expert, design engineer
6. Record organization, test rules, value ranges, standard data
7. Tool/technology description
8. Interactive terminology compiler
9. Input
10. Correction
11. MID files
12. Description of technical formations including their structure and technical data
13. Generation and storage of company-specific models
14. Relational database system (tables/texts/programs)
15. Company-specific application system
16. Job record printing,...
17. Establishment of descriptive technical terminology
18. System generators
19. Sketch generation
20. CAD system
21. Record generation
22. Relational database system (sequence processor)
23. Object files
24. Current objects (APSK, STL,...)
25. CAD/CAM database
26. Creation of documentation
27. Syntax-based object editor
28. Manipulation
29. Testing
30. DMS files
31. Record [illegible] manipulable object
32. Expansion
33. Output
34. Printing
35. Looping

individual normative guidelines and standardized texts, continuing through programs to calculate time and materials planning needs and automatic programming, ending in the complex elaboration of processes.

The individual areas of activity and requirements of the various user groups (planners, technical specialists, design engineers) on the one hand as well as the systems engineers on the other hand are thoroughly taken care of.

The comprehensive generative capabilities are productive tools in the progressive development of the user application and its timely updating. Understandability is achieved through close integration and uniform handling of the functions for elaboration and creation of all records as well as through support for application-specific user operation.

In addition to appropriate application documentation and central training, technical support services are offered to the user through the VEB DVZ Magdeburg.

Modes of Use

RTV procedures and results are illustrated from the user viewpoint through three selected examples of applications:

Solution for Typical Mechanical Engineering Production

For many years now, the VEB Central Repair and Supply Facility (ZRAW) Gommern of the Petroleum/Natural Gas Combine, a combine with primarily small to medium-sized production series based on the workplace principle, has been working with DVZ Magdeburg on the licensed use and design of a rationalization solution for computer-aided technical preparation for production. To date, four task complexes have been worked out for routine operation using the RTV system (4):

- Generation of technical documentation, for example, APSK's [working plan master cards], master cards, work instructions, time calculations.
- Transfer of technical documentation recorded on data acquisition devices to the central database.
- Design and management of the central database, including the search capability (database-specific) and technical update service.
- Conversion of company-specific documentation (working plan master cards and parts lists) to the central data processing document TAB I.

All task complexes are supported by interactive monitor dialog (remote data processing) with the ESER computers in the VEB DVZ Magdeburg. Computer-aided generation of technologies is performed for the parts catalog of transitions, flanges, and general rotationally symmetric parts.

For technical specialists, the outlay for preparation of workpiece descriptions is thus reduced. The APSK's generated are stored directly in the central database, forming the basis for subsequent projects such as materials and capacity planning. The database has a projected capacity of approximately 50,000 technologies.

RTV offers the potential for comprehensive solutions for problems arising in production preparation.

Thus, with computer-aided creation of technologies, capacity economies of approximately 50 percent occur. The accuracy of technical documentation is increased.

To take advantage of decentralized computer technology, a technical specialist workstation on the PC 1715 was designed at the VEB ZRAW Gommern for capture, modification, and generation of technical documentation. Use with 16-bit technology (EC 1834) is under development.

Solution in the Toy Industry

Licensed use and application of the basic RTV solution by the VEB SONNI Sonneberg is being implemented in cooperation with the VEB DVZ Suhl with the support of the VEB DVZ Magdeburg. The objective (with a completely new solution for this industrial sector) is to master calculation of material and time outlays to achieve higher flexibility relative to market requirements through exact production data (5). In the VEB SONNI Sonneberg approximately 6,000 products are manufactured with an innovation rate of approximately 50 percent.

For product-oriented production, the basic typical RTV solution from mechanical engineering is used effectively, with new organizational forms opening up for technical preparation for production in this firm at the same time.

The first section of the company-specific rationalization solution was implemented for production after 12 months. For this, not only were the data for the APSK's generated, but parts lists and materials kits were produced completely from the product description and stored in the database.

Actual use is interactive with the ESER computer of the DVZ Suhl. An overall savings of technical specialist time of approximately 60 percent (13 hours per APSK) and a reduction in the time needed for generation of documentation during development of new products of approximately 80 percent (from 12 weeks to an average of 1 week, even to 1 to 2 days if need be) are achieved.

Solution for Typical Steel Fabrication

The basic RTV solution in the VEB Conveyor Systems "7 October" Magdeburg (FAM) is based on particularly complex user requirements. The design and application of an integrated CAD/CAM system is being implemented in close cooperation with the VEB DVZ Magdeburg, using both workplace-based computer technology (at the user site) and central ESER electronic data processing (at the DVZ).

The following components have been implemented:

- Design, servicing, and use of the central database,
- Tie-in of the automatic belt conveyor design system of the VEB FAM with transfer of design data to the central database, for calculation of materials needed, among other things,
- Revision of technical production documentation for individual parts and assemblies of steel products

using the basic RTV solution along with stored production data from the firm.

Work is in progress on development of a CAD belt conveyor system (6) for computer-aided generation of sketches and its tie-in to the company-specific CAD/CAM concept of the VEB FAM (7). Design of standardized user interfaces for the various partial systems is being carried out based on problem-based technical terminology. With full implementation of the comprehensive solution, the time required for preparation of all production documents will be reduced through computer-aided technical preparation by 75 percent compared to manual procedures. Faster delivery of products and increased competitiveness on the international market will be achieved through the significantly reduced time spent on preparation for production.

Abstract

The RTV 2000 product line includes flexible basic software for computer-aided elaboration and creation of documentation, specifically for the tasks of technical preparation. It is distinguished by the use of modern workplace computers with different levels of performance as well as uniform handling of systems for different user groups using CAD/CAM tools and descriptive technical terminology to be agreed to. This permits designing specific user-computer interfaces with efficient user operation including comprehensive generation of company-specific applications. Selected methods and functions are used for development, storage, and dynamic servicing of company-specific models. They support the elaboration of documentation according to the similarity, variant, and generation principles and guarantee reproducible results.

An orientation to comprehensive data processing using modern communications technology and the connection of databases on ESER electronic data processing is provided.

The provision of efficient file interfaces permits integration with a view to a long-term CIM strategy.

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Microprocessor Module for Poland's MERA Computer Family Described

26020005 Warsaw INFORMATYKA in Polish No 5, May 89 pp 11-13

[Article by Kazimierz Kaczmarczyk: "Characteristics of a Microprocessor Module for the MERA 600 Computer Family"]

[Text] In the 1970s MERASTER began production of the MERA-60 computers based on Soviet-made microprocessors and other microcircuits [1]. The M1 microprocessor was used during the first production stage, and later the M2. The LSI-11 and LSI 11/2 respectively, made by DEC, were the models for these microprocessors. Several years later MERASTER began production of the MERA-600 computer family based on the M6 microprocessor, which is the counterpart of the LSI-11/23 made by DEC. These computers have an architecture compatible with the Q-bus. In comparison to the M2, the M6 microprocessor is characterized by higher operating speed, the capability of memory expansion to 4 mb, and an expanded instruction list. Manifold increase in operating speed is achieved by increasing the frequency of the phase pulses clocking microprocessor operation, the use of a floating-point processor, a microprogrammed control cycle, and other system solutions. The expanded instruction list contains an additional 46 instructions for performing floating-point operations and expanded memory control instructions. This solution has made it possible to ensure compatibility with SM-4 and SM-1420 computer software. The addressable RAM is increased to 256 kb or 4096 kb in two versions by introducing a memory management unit converting the 16-bit virtual addresses to 18-bit or 22-bit physical addresses.

The M6 microprocessor is made in two versions, the MS 1601.01 and the MS 1601.02. The MS 1601.01 operates at a speed of approximately 500,000 operations per

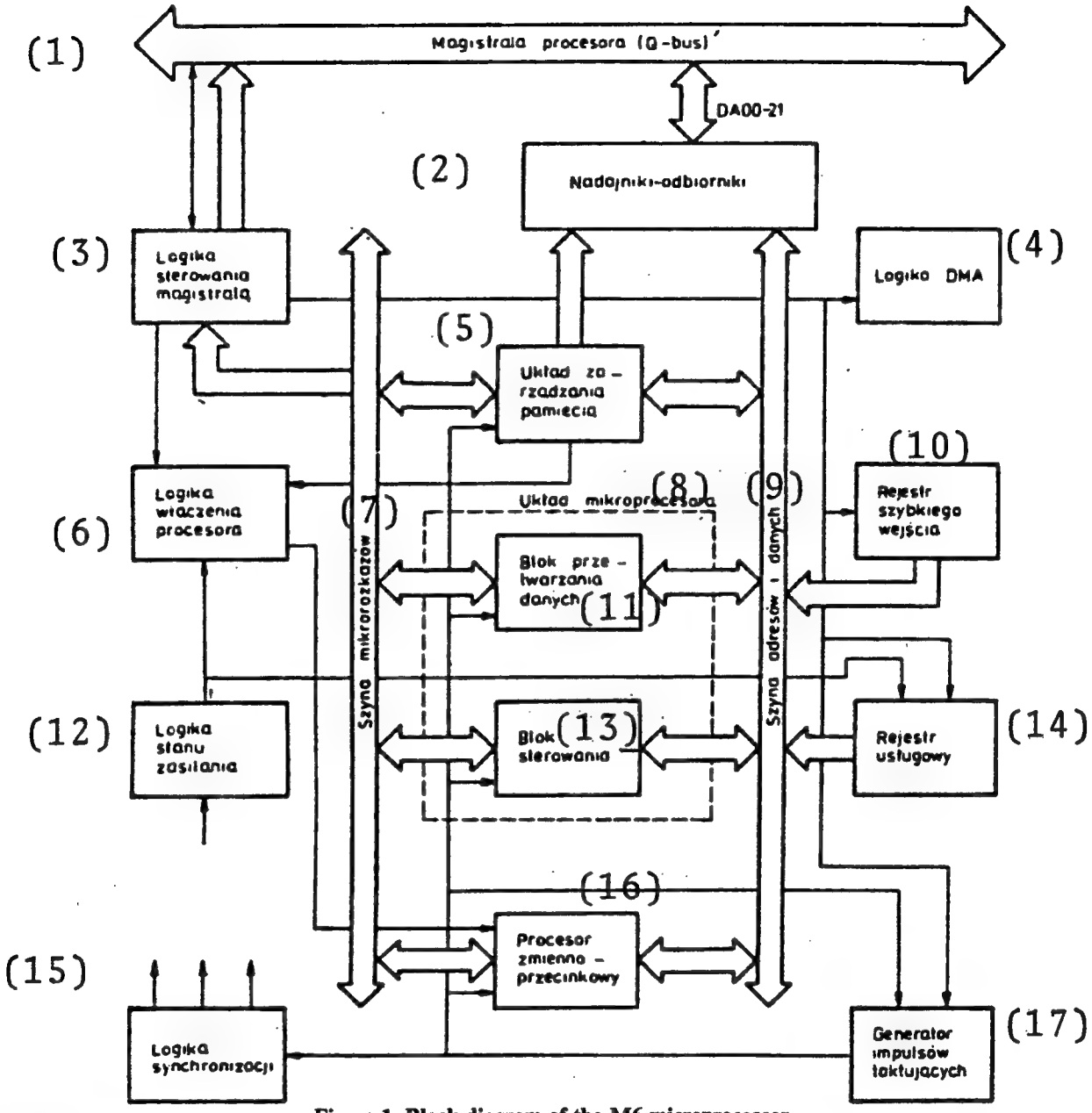

Figure 1. Block diagram of the M6 microprocessor.

Key:
1. Microprocessor bus (Q-bus)
2. Transceivers
3. Bus control logic
4. DMA logic
5. Memory management unit
6. Microprocessor switch on logic
7. Microinstruction bus
8. Microprocessor circuit
9. Address and data bus
10. Fast input register
11. Data processing unit
12. Power supply status logic
13. Control unit
14. Servicing register
15. Synchronization logic
16. Floating point processor
17. Clock pulse generator

second, and memory can be expanded to 256 kb, while the MS 1601.02 microprocessor operates at a speed of up to 600,000 operations per second, and the RAM can be expanded to 4 mb. Both versions carry out 138 instructions (92 fixed-point and 46 floating-point operations). They are built on an identical chip measuring 252 x 143 x 12 mm. A block diagram of the M6 microprocessor is shown in Figure 1. It incorporates three special very large scale integration circuits, the microprocessor, a memory management unit, and a floating-point processor.

The Microprocessor

The microprocessor consists of two special microcircuits in a single housing made by n-MOS technology. One of them performs the function of microprogram control unit, and the other that of processing to carry out the 92 fixed-point instructions on the list (Figure 2). The processing unit executes all arithmetic and logical instructions, services input and output of 16-bit addresses and data from the microprocessor bus (except calculation of the address executed, by the memory management unit), and also generates the majority of the bus control signals and the internal microprocessor operation cycles. This unit contains the following functional subassemblies: arithmetic-logic unit, set of registers, recording multiplexer, address multiplexer, instruction control and formation logic, instruction execution branching logic, and microinstruction and system instruction register.

The arithmetic logic unit executes all fixed-point arithmetic and logic instructions. The type and nature of the data processed are determined by the 16-bit microinstruction coming from the microinstruction register. Processed data from the ALU are delivered to the input of a multiplexer which transmits them on the two-way internal bus to port A, which stores the result of the operation. The two-way bus also makes it possible to send data from the microprocessor bus. Port B serves the purpose exclusively of reading data, and port A that of both reading and writing. The set of registers also contains 9 universal registers and 5 working 16-bit registers used to perform fast operations in conjunction with the memory. The universal registers may be used as accumulators, index registers, stack indicators, instruction counters, autoincrement and autodecrement registers, etc.

The microprocessor can operate in one of two modes, user and supervisor. Two registers R6 are used to switch the microprocessor rapidly from operation in one mode to operation in the other. Selection of one of registers R6 is determined by bits 14-15 of the microprocessor status register. The HALT, RESET, and SPL instructions are not used in the user mode. The meaning of the individual status register bits is given in Table 1, and the relationship of the mode to the value of bits 15-12 in Table 2.

Table 1. Microprocessor Status Register

Bit	Meaning
15-14	Current microprocessor status
13-13	Previous microprocessor status
11-8	Not used
7-5	Interrupt levels
4	T—interrupt servicing allow
3	N—negative operation result
2	Z—zero operation result
1	V—arithmetic overflow
0	C—carry

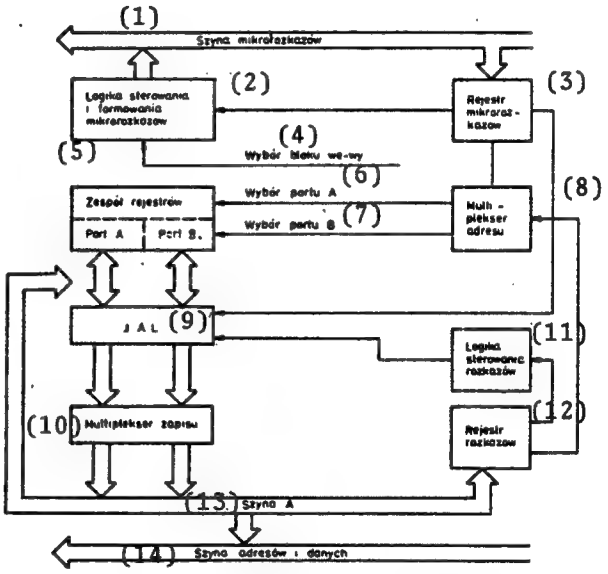

Figure 2. Block diagram of processing.

Key:
1. Microinstruction bus
2. Microinstruction control and formation logic
3. Microinstruction register
4. I/O unit selection
5. Register set
6. Selection of port A
7. Selection of port B
8. Address multiplexer
9. ALU
10. Recording register
11. Instruction control logic
12. Instruction register
13. Bus A
14. Address and data bus

Table 2. Microprocessor Operating Mode Versus Value of Bits 15-12

Current mode	Previous mode		Microprocessor operating modes		
bit 15	bit 14	bit 13	bit 12	Current	Previous
0	0	0	0	Supervisor	Supervisor
1	1	1	1	User	User
1	1	0	0	User	User
0	0	1	1	Supervisor	User
1	0	1	0	Inhibit	Inhibit

The instruction register is loaded with current instructions, and if the latter are jump instructions the register initiates program branching. The address register decoder ensures direct access to a selected register. The control and microinstruction generation logic controls microprocessor operation and computer bus coupling. The control unit contains the microprogram memory and the logic controlling execution of microinstructions and commands from the operator terminal.

The microprogram memory is a large scale integration circuit containing a programmed logic matrix (PLM) with a capacity of 138 25-bit microwords and permanent memory with a capacity of 414 25-bit words controlling the operation of the entire circuit. The ALU and PLM were installed separately in the earlier M1 and M2 microprocessors. Combining them in a single housing has made it possible to reduce the processing time because of elimination of transmission over the internal bus. The microwords are divided into two fields, a 16-bit microinstruction field and a 9-bit field determining the address of the following microinstruction. The system instruction codes are recorded in the PLM input register by way of the address and data bus. The first microword taken from the PLM contains the start address of a microprogram present in read only memory or the address of an interrupt servicing microprogram. The 9-bit code of the address of the following microinstruction taken at the same time as the current address is also delivered to the PLM input.

Floating Point Processor

The floating point processor is made up of two microcircuits located in a 40-terminal integrated circuit in a ceramic housing. It performs the following operations: arithmetic and logical operations with floating point numbers, conversion of integers to floating point numbers, and special instructions to optimize mathematical subroutines.

It executes a total of 46 instructions in exactly the same way as does the CPU. Routinely sampled instructions are analyzed and if 4 more significant bits of the instruction selected have a value of 15 (octally 17), the CPU executes the servicing subroutine of the floating point processor. The floating point processor executes the instruction more or less simultaneously with subsequent sampling of an instruction by the CPU (protection instructions and operations ending in sending of data to memory are exceptions). Maximum time benefit is achieved for arithmetic operations in which the internal registers are used to store data and data from the registers are sampled by the CPU. The floating point processor performs operations 5 to 10 times faster than in the case of program execution.

When an error occurs, the floating point processor notifies the CPU by means of an internal interrupt. The cause of the error can be identified by reading the status register of the floating point processor. This processor contains 8 registers, A0-A7. Registers A0-A3 are universal registers; data are stored in them during all calculations and transfers to memory. Registers A4-A6 serve the purpose of temporary storage of data taken from RAM and then recorded in the register indicated by the instruction. Register A7 acts as the status register of the floating point processor. Each register is considered to be a 32-bit one for the single precision mode and a 64-bit one for the double precision mode.

The microprogrammable control circuit is a separate unit of the floating point processor. It controls the operation of all logic circuits during execution of instructions. It consists of memory holding microprograms and control signal generation logic. The speed of execution of operations by the floating point processor is 5 to 10 times higher than in program execution.

Memory Management Unit

This unit provides for increase in RAM address space to 256 kb or 4096 kb (depending on the type of microprocessor) and for memory protection. Converting the 16-bit virtual address to an 18-bit or 22-bit physical memory address results in increased addressing capacity. The units consist of two sets of 16-bit active page registers; a summator, comparator, and inhibition circuit; six 64-bit registers for floating point operations; and a status register.

All memory management unit operations are carried out on the basis of the contents of the set of active page registers and the R0-R3 status and control register. The set of active page registers consists of eight page address registers RAS and eight page description registers ROS for the processor operating mode selected (system or user). The physical address is generated by the summator (see Figure 3) on the basis of the contents of status register RS2, which stores the virtual address of each instruction selected and the address indicated by bits 13-15 of the active page register. The three most significant bits of this address designate the page number, that is, the specific RAS/ROS pair taken into account in generation of the physical address of the memory cell.

Composition of the address shown in Figure 3 results in a physical address of 565746 for 18-bit addressing. Extension of the address to 22 bits (4 mb) is a function of the status of bit 04 of status register RS3 of the memory

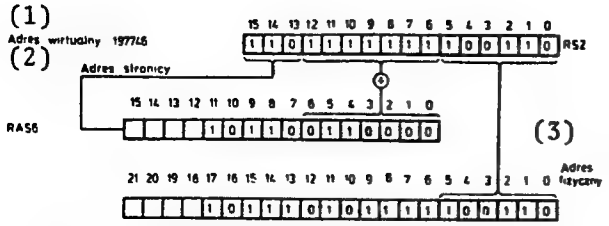

Figure 3. Diagram of physical address generation.

Key:
1. Virtual address
2. Page address 3.
Physical address

management unit. For a bit 04 value of 1 the logical space address is 4 mb; for a value of 0 it is 256 kb.

Other Processor Circuits

Other CPU circuits (see Figure 1) establish communication with RAM and peripheral devices, control the bus, and generate special control and auxiliary signals.

The generator generates clock pulses for the microprocessor and other elements. Its frequency is 13.3 mhz, and the shortest microprocessor operating cycle is 300 nanosec (it does not include interaction with the bus). A fast input register sends data to the microprocessor on the status of the power supply and startup mode during initial or repeated switching on of the computer. A servicing register registers and transmits to the CPU data on the causes of an interrupt and the status of the direct current or alternating current power supply. The direct memory access and bus control logic circuit exchanges data between I/O devices, the CPU, and RAM, and also generates signals allowing the sending of status data to the microprocessor.

Data are transmitted from the microprocessor and other processor circuits by means of two internal two-way buses by multiplexing. They are a microinstruction bus over which memory management unit and control logic microinstructions are transmitted in one cycle, and in the other cycle a unit of processed data from the floating point processor—an address and data bus over which data, the address, and status information are sent (by time multiplexing).

In computers based on the M6 microprocessor there is no key register by means of which an operator could execute instructions manually, as for example selection of the address of a cell, recording of data in memory, etc. All these functions are performed by using a terminal, by sending appropriate commands to the processor. The terminal may consist of a monitor and keyboard. All operator console software is contained in the memory of the microprograms. These microprograms are executed when the power is switched on.

The M6 microprocessor executes instructions of 3 types: nonaddress, single-address, and 2-address instructions. The extensive set of addressing modes typical of the LSI-11 computers permits highly efficient processing of the data stored in any memory cell or register. The operations associated with execution of an instruction relating to a registered addressing mode are internal with respect to the microprocessor and require no additional bus transmission cycles (except instruction sampling).

On the basis of the M6 processor, the MERASTER plant in Katowice has started up manufacture of the MERA 600 computer systems, in different configurations determined by their purpose. A typical example is the MERA 385 computer consisting of the following basic elements: M6 CPU, 256 kb or 4 mb RAM, operator console, dot matrix printer, storage on 5.25-inch floppy disks and on replaceable 5-MB to 25-MB disks or Winchester disks, RT-60 real-time operating system, and Basic, Fortran, Pascal, and C programming language compilers. Supplied as optional equipment are SM 5300.01 tape storage, 2-MB to 10-MB buffer storage, CAMAC and IEC 625 interfaces, the V24 16-channel multiplexer, synchronous and asynchronous transmission modules, and modules for networking operation.

The mean time to failure of the M6 processor is estimated at 1,000 hours, and the power consumption of the central unit approximately 1.3 kva.

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MICROELECTRONICS

CEMA Microelectronics Products Displayed at Leipzig Fair

23020090a East Berlin
MIKROPROZESSORTECHNIK in German
Aug 89 pp 253-256

[Report on the Leipzig Spring Trade Fair 1989 by H. Hemke, H.-J. Hill, H. Weiss]

[Excerpt] The first part of our report from the Leipzig Spring Fair 1989 (LFM '89) in MP 7/1989 was devoted to the fair's theme of "Flexible Automation" and to mini- and microprocessors. The second part will deal with the exhibits of computer peripherals, PC applications and networks, components, and software.

Peripherals

An indispensable requirement for Computer Aided Design (CAD) is graphic design capability, which is usually achieved by means of plotters. The new A3 Plotter K 6416, produced by the collective combine

Robotron, has a resolution of 0.01mm and a drawing speed of 300mm/s. Technical drawings can be produced with standard boundaries and title blocks using expanded margins. The drawings can be produced on white paper as well as on transparent paper or foils in eight line widths or colors. The data buffer has 14 Kbytes.

The Polish firm Z.M.P. Mera Poltik Lodz offered the A4 Plotter MDG-1 with a medium drawing speed of 63mm/s and a resolution of 0.2mm. Its compact construction (300 x 190 x 85 mm^3) makes it very suitable for office installation. Centronics and V.24 are available as interfaces. It has four pins and can produce both text and graphics.

The Erika electronic S 6007 typewriter by Robotron, also introduced for the first time at the LFM '89, can be used as a printer. Its advantage over the precursor model Erika S 6006 lies in the fact that its print wheel has been placed in a cassette to accelerate replacement; changing the ribbon was also greatly facilitated. Instead of the typical 3-interface module, the S 6007 possesses only *one* unimodule, which contains the Centronics, Commodore, and V.24 interfaces. Print wheels with IBM, Schneider, Commodore, and typewriter character sets are also available. The operating modes of the individual interfaces can be modified with DIL (dual-in-line)-switches present in the unimodule.

PC Applications and networks with PCs

The development of computer technology has caused the demand for computer linkage to rise, with the emphasis less on the transfer of data than on joint usage of large amounts of data. The most common computer networks today are still the LANs (Local Area Network). Robotron was represented at the LFM '89 this time with the new LAN EC-NET. It is constructed from ROLANET 1 components and is used exclusively as a link to the personal computer EC 1834. The program package EC-NET with the operating system DCP 3.30 serves the worldwide NETBIOS interface. It includes such functions as sending, receiving, and storing data and offers diskettes, dictionaries, and printers for joint usage in the LAN. Access to the network is via programs such as dBase III Plus and ARIADNE, via computer languages such as C and T-PASCAL, and via DCP commands such as DIR and COPY.

In addition, Robotron presented new applications for the SCON-LAN. Alongside programs for literature research and joint databank usage, it demonstrated linkage with digital radio link technology. The digital radio link devices PCM 10-300/400/800 are used in order to transmit data over long distances and difficult terrain features. They can link individual remote SCOM-LAN users as well as several LANs. The distance between two radio link stations can be as much as 50 km. A transmission path contains 10 channels with a transmission speed of up to 64 Kbits per second. If the number of data stations to be linked exceeds 10, data mulitiplexers are inserted, which combine several data signals of medium bit rates (0.6 to 9.6 Kbits per second) to one signal of 48 or 64 Kbits.

The Hungarian firm Videoton made its 20th appearance in Leipzig. It presented, among other things, a method of integrating an EC 1834 into a NOVELL-LAN. The ARC-NET (with a transmission speed of 2.5 Mbit/s) or the Ethernet (10M bit/s) were offered as associated hardware. The 32 bit microprocessor VT 180 was used as the server. LAN-users can be the VT 110, the VT 160 or other XT- or AT-compatible computers. The network software is compatible with the Novell Advanced Netware 286 or the Novell System Fault Tolerant Netware 286. It contains functions such as controlled access to joint data, systems for directory backups and file identification tables, parallel treatment of magnetic disks, as well as continuous checks and error messages. Linkage with the Ethernet network of the VT 32 and the R 11 can be achieved using gateway data transmission.

In our report from the Budapest Trade Fair 1988 (see MP 10/88) we showed how an A 7150 can be equipped to act as a teleprinter. The Hungarian firm Triton developed the necessary connecting pin board and software package Gepard-16, which were demonstrated at the LFM '89 at the Robotron and Triton booths. With the Telex-PC, individual telex users in the national and international telex network can be reached through a dial system. In addition, and without interfering with these services, it permits the processing of, for example, routine office tasks.

Components

—Microprocessor circuits The microprocessor system U 80600 is the second 16-Bit system after the U 8000 produced by the collective combine Mikroelektronik Erfur. Its proposed 20 components will make it possible to develop a new generation of personal computers and control systems (for example, ICA 720). The four new types (sic) of this system first shown at the spring trade fair are the central processing unit (CPU), the bus controller, the DRAM controller, and the error detection and correction (EDC) circuit.

The CUP U 80601, which is downward compatible to the K 1810 WM86 (USSR) will run at a maximum of 16 MHz. Its main improvements are the two addressing modes, real and protected, and its complete storage protection as a requirement for multitasking. The U 80606 bus controller decodes the status signals of the CPU and then produces the corresponding read and write commands for the bus of the computer. The DRAM controller U 80610 facilitates the formatting of dynamic memories, which can consist of 16, 64, or 256 Kbits. It controls an address space of a maximum of 2 Mbytes and is suitable for driving Dual-Port RAMS. In conjunction with the EDC U 80608, it allows for the detection and correction of errors as well as the simple

formatting of large memory arrays. These four circuits of the U 80600 system were already thoroughly presented in MP 5/1989.

Alongside the still dominant NMOS technology, CMOS technology is becoming increasingly prevalent in microelectronics. The classic advantages of NMOS technology—larger scale integration, higher speed, lower price—are being counterbalanced with the further development of CNOS technology. The U 84C00 family of microprocessors from Mikroelektronik Erfurt is the first 8-Bit CMOS family produced by the GDR. The following circuits were on display in Leipzig: CPU U 84C00, PIO U 84C20, CTC U 84C30, and SIO U 84C40 with clock times of 2.5 MHz (U 84C00 DC02) and 4 MHz (U 84C00 DC04). All circuits of this family are software- and hardware-compatible with the U 880 family and have the advantages of less current consumption and higher reliability. The following table shows a comparison of current usage (at 4 MHz):

	U 84C00 Family	U 880 Family
CPU	25mA	200mA
PIO	5mA	100mA
CTC	7mA	120mA
SIO	15mA	130mA

To further decrease current consumption, the circuits of the U 84C00 system can power down when no computer activity is necessary. Activation of this mode is controlled by a clock generator/controller (CGC).

The U 84C00 system will be presented in detail in an upcoming issue.

The collective combine Mikroelektronik Botevgrad (VR Bulgarian) offered the 16-Bit microprocessor system SM 688 for the first time in Leipzig. It is compatible with Intel System 8088. The switching circuits CPU SM 688, DRAM Controller SM 637, Floppy Controller SM 609, and Hard Disk Controller SM 610 were exhibited, among others.

Surface mountable devices (SMDs) are becoming more widespread internationally because they occupy less space. Mikroelektronik Erfurt has responded to this trend with the 8-Bit one-chip computers U 883 and U 886, as well as the 64 Kbit DRAM U 2164 and the windowless 32 Kbit EPROM U 2632 as SMDs.

—ASICs Parallel to traditional devices in SMD design, the space requirement of entire circuits can be reduced much more effectively by using application-specific integrated circuits (ASICs)—which in turn can be SMDs. The Carl Zeiss JENA collective combine has been offering two different ASIC types for a year, the CMOS Gate Array System U 5200 and the standard cellular circuit U 1500/20 (the U 1500 differs from the U 1520 only in the number of wiring levels). The Gate Arrays on prefabricated silicon dices require that the number and position of the functional elements and chip surfaces and pin numbers be constant, in return for which they can be obtained more quickly and at less cost. The standard cellular circuits, on the other hand, allow a varying number and position of standard cells and differing chip surfaces and pin numbers. The further developments of the U 5200 and U 1500/20 systems now presented are the Gate Array System U 5300 or the Standard Cellular System U 1600. The development of the integration scale of these ASIC types is due to the number of transistors on a chip.

U 5200	12000	U 1500/20	13000
U 5301	40000	U 1600	100000
U 5302	70000		

Both systems include inverters (with and without driver activity), basic gates (such as NAND, NOR, XOR, XAND, and combinatorial linkages), half and full adders, JK and D master-slave flipflops, as well as many input and output levels with and without D flipflops or Schmitt-trigger/Tristate action. The gate delay time in both systems is a maximum of 1.6 ns, with which a U 1600 achieves a clock frequency of 25 MHz; its static current absorption is less than 400 gmA. The clock frequencies of the U 5300 depend on the type of Master. The Masters U 5301 and U 5302 can have clock frequencies of 40 or 30 MHz; their static current absorption is less than 200 gmA. Zeiss is offering a design system called Archimedes for the gate arrays (see also part 1 of our LFM report as well as MP 6/1989, p. 168). The design system ENSIC is available for standard cells.

—storage circuits It is known that the collective combine Carl Zeiss JENA is directing major efforts toward developing dynamic and static RAM circuits. Whereas the 256-Kbit DRAM U 61256 in a 1.5- gmm CMOS technology was premiered at the LFM '88, at this year's spring trade fair the 1-Mbit DRAM U 61000 in a 1- gmm CMOS technology was already available for presentation. Both circuits will belong to the standard equipment of modern personal computers and workstations. The U 61000 was exhibited with an 18-channel DIL duroplastic casing, but can also be delivered in a ceramic casing. It will be available with access times of 100 and 120 ns (U 61256:80, 100, 120 and 150 ns). Its input and output are TTL- and CMOS-compatible. It currently has a structure of 1 M x 1 Bit and can work in 11 different operation and refresh modes. The U 61000 is compatible with comparable international types such as the TC 511000 (Toshiba) and the HYB 511000 (Siemens). In issue 10/89, this circuit will be presented in further detail.

In order to construct large storage arrays that occupy minimum space, the collective combine Keramische Werke Hermsdorf has begun to mount 256-Kbit chips as well as 1-Mbit chips on ceramic substrates, which result in circuits with 4 Mbit storage capacity. The 4737 contains 16 chips of the U 61256 circuit, which each

form a ceramic base condenser and together form a memory of 256K x 16 bits. The 4737 has a 34-channel DIL casing (row spacing: 37.5 mm; height: 5 mm; pinraster: 2.5 mm) and is offered only with an access time of 150 ns. Another model of this circuit is the 4743 with a storage structure of 512K x 8 bits. The 4742 circuit in a 25-channel SIL-structure, on the other hand, is constructed of 4 chips of the U 61000 1-Mbit RAM (also each with a condenser). This provides a storage capacity of 1 M x 4 bits.

Memory circuits were also exhibited at the booth of the collective combine Mikroelektronik Botevgrad: the 64-Kbit DRAM SM 8164 (structure: 64 K x 1 bit; technology: NMOS; access times: 150 and 200 ns), the 4-Kbit SRAM SM 8514 (1 K x 4 bit; CMOS; 200, 300, and 450 ns), and the 64-Kbit EPROM SM 7764 (8 K x 8 bit; NMOS; 450 ns).

Software

To demonstrate Robotron's 8- and 16-bit technology, Robotron Berlin exhibited the Portable Economic Software System POESY. It performs the functions of cost accounting, wage and salary calculation, basic resource, investment, and materiel calculation, performance and benefit analysis, and calculation results. All the elements of this system can be installed individually or combined with one or all other components. This is to ensure simple management through an easily surveyed program structure, a menu-driven selection of program parts, error determination, etc.. POESY will be steadily developed and improved and adapted to new technology. It is offered for the 8-bit PC 1715 with the SCP operating system, the A 7100 with the SCP 1700, and the 16-bit A 7150 PCs and EC 1834 with DCP; in the absence of a hard disk, work can be accelerated with the support of a RAM disk.

Robotron also demonstrated possible applications of the EC 1834 in Arabic and Chinese text editing. The ALBAYAN system with the DCP operating system allows Latin and Arabic characters to be edited, manipulated, configured, and printed within one text. In the *arabic* editing mode the individual characters are written on the screen from right to left, as is customary. Either English or Arabic can be chosen to drive the menu. The ALBAYAN system also has numerous functions for comprehensive text manipulation and configuration.

With the Chi-Easy system, Chinese characters can be input to the PCs using the operating system MS-DOS. In order to input the desired character a specially coded character pattern is used and a reading pin is passed over the character as in normal writing. However, a maximum of 5 to 6 strokes is necessary for the 6,763 characters contained in the character set, because after each new stroke 8 of the most common characters containing those strokes are displayed, selected and written on the screen. In 85 percent of the cases, the desired character is found after the second stroke. The texts can also be output to a printer.

With a knowledge-based development of problem-specific software using 2the X...System, programs in various target program languages can be written, including already existing program libraries. By modifying or exchanging the installed knowledge base, the system can be adapted very easily to the most diverse tasks. The software developer is provided with a modern and effective means for developing computer-based software, and the end user is provided with extremely flexible application software and with a convenient and efficient tool for software documentation and maintenance. With the X...System, the user can work in the program development mode and the programmer can work in the editing mode. Work is facilitated by numerous service functions, such as the graphic representation of program structures and the superimposition of verbal and graphic help and control functions using window technology. The X...System was developed by the Academy of Sciences of the GDR and to date has been successfully installed in the following packages: Xamba (production of programs for microscope image evaluation), Xfortran (production of programs for evaluating pictures of the human heart), and Xdbase as an intelligent databank interface.

As in previous Leipzig trade fairs, software solutions were also exhibited at Karl Marx University during the 1989 spring trade fair that were developed in the framework of scientific and student research work.

The Technical Electronic Section of Wilhelm Pieck University Rostock was represented with the comForth programming system, which offers a portable and interactive environment for developing process-oriented software in Forth.

In addition to the base system, the 2.xx version of the comForth system contains components that can be added later, such as a program collection for data types, number inputs, etc., headerless help definitions for modular-oriented programming, and screen and keyboard adaptations. A Wordstar-compatible editor, assembler, and debugger are also offered, as well as additional specific functions of the respective operating systems. The comForth system is to be offered immediately for CP/M (Z 80 and 8086) and MS-DOS (8086). Add-ons, such as a numerical package (flow comma and matrix operations), the multi-task system for process automation tasks, and the Cross-Compiler are being developed and are already available for some processors.

The menu-driven statistics package PSYSTAT for 16-Bit PCs using MS-DOS was shown by Karl Marx University Leipzig; a somewhat stripped-down version of the package is to be available for the A 7100 as of September 1989. Immediate application through a conversation-oriented operating method is to be made possible without any special prior knowledge of computer technology. The program is characterized as much by its comprehensive help menus aimed at possible user operations, constant data on the actual statistical process, and the instantaneous operation of the computer, as it is

by the lack of diversity in the statistical processes of given add-on possibilities through user algorithms, and a graphic data presentation. Only a few of the possible statistical algorithms are mentioned here, such as variance, variance width, ranking, frequencies, percentage ranks, histograms, multiple linear regression with up to 50 influencing variables and graphic output of function and point cloud, as well as several processes for factor, cluster, and discriminant analysis.

GDR's Flexible Automation Systems Displayed at Leipzig

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[Article by H. Hemke, H.-J. Hill, and H. Weiss: "Flexible Automation: '89 Fair Theme"]

[Excerpts] Integration of microelectronic components and devices into systems for manufacture of tools and processing machines is acknowledged worldwide as the recipe for success for increased productivity and product quality. It is the prerequisite for conversion from individual machines to flexible automation machine systems. The theme of both 1989 Leipzig fairs establishes the objective of presenting this close interconnection of microelectronics and machine manufacture in the exhibit program of domestic and foreign exhibitors as well as in scientific and technical organizations and of demonstrating future-oriented solutions. Especially in the metal processing industry, but in other fields as well, flexible production automation is currently the most progressive manufacturing concept. With this theme, the Leipzig fair continues its time-tested practice of placing internationally current economic developments in the focus of fair activities. For the spring fair [LFM], the great demand from abroad for exhibition space, especially for the machine tool and tool sectors, as well as the numerous registrations for specialized lectures related to the theme underscored the lively interest in this theme. The effect of information technology on production is reflected not only in its integration into machine manufacture—demonstrated for example in exhibit hall 20—but also in virtually all areas of production.

In the first part of our report on the LFM we concentrate primarily on the area of computer-aided design where it no longer seems practical to make a strict separation of software and hardware. We then turn to that computer technology which cannot be classified as CAD/CAM-specific: personal computers, for example.

In the continuation of the report on the fair in MIKROPROZESSORTECHNIK No. 8/89, we will tell you about peripheral hardware, modular units, and additional software offerings.

CAD/CAM/CAP

The Automation Plant Construction Combine's top-of-the-line product for flexible automation was the industrial computer ICA 700 (industrial computer automation). For the first time the terminal model of the ICA 700 was introduced as the lead computer for a cell of flexible automation systems for turned parts and case parts with a tall shelf-type bin and with assembly robots. The range of applications of this family of computers extends from programming under DCP and use for data acquisition and processing, control and oversight of groups of units, sections of plants, and production lines as well as for laboratory automation all the way to startup and servicing of automation devices and systems. This universality is achieved through a two computer design (PC and realtime computer) and a modular component structure of the realtime computer section as well as through a family of devices. This family of devices consists of the modular, user-configurable model ICA 710.10, the cabinet model ICA 710.20, and the terminal model ICA 710.30. The devices of the ICA 710 series use the 8086-compatible processor K1810WM86, and their PC component is PC/XT compatible. However, the PC component of the future ICA 720 series will be PC/AT compatible and will be expanded by the portable model ICA 720.40.

Using the ICA 710.20 as an example, a few major features are mentioned: The cabinet model industrial computer designed primarily for use under harsh conditions consists of a main computer (PC component) and a process link (realtime computer system). The two computer components are linked via an internal ICA interface. The PC component includes a 20- to 40-MByte hard disk, two 720-K floppy drives, 256-K RAM (expandable to 640 K), 32-K ROM, and the 4.915-MHz K1810WM86 (K1810WM87 as an option). The operating system may be either DCP or the UNIX-compatible MUTOS. The realtime computer component has a system bus and a resident bus. The multimaster-capable system bus is compatible with the multibus, the AMS bus, and the system bus of the MMS 16 (16 master maximum). The resident bus is identical to the system bus except it lacks multimaster capability; with it, all operations run without conflict and at maximum speed. The realtime computer component includes a central unit with K1810MW86 and K1810MW87, battery-supported SRAM in addition to DRAM's and EPROM's, interfaces (IFSS, IFSP, Centronics, V.24, IFLS), and the Ethernet-compatible ROLANET 1 as an option. Six distinct digital and two distinct analog units are available for process input and output; a maximum of 22 process I/O components is possible. BOS K1810 and EMOS 2 may be used as operating systems.

Minispot is one model of the SPOT 83 process computer system from the Romanian company ICE-Felix-Werken. The system is distinguished by its variability relative to both the CPU—a single board computer—and the process-specific module. Whereas, for example, the CP 04 version has the 8080 8-bit processor and the CP 05 version has the Z 80 8-bit processor, the CP 06 model with the 8086 16-bit processor was introduced in Leipzig. Furthermore, the board contains a maximum of

128-K RAM and 32-, 64-, or 128-K ROM. Four RS 232C's or, as an option, the 20-mA current loop may be used as interfaces. Thus, it is possible to use the Minispot computer as a stand-alone system, a local system, or a remote system—for example, linked to the Romanian CORAL or Independent I102F/I106 minicomputers, which use PDP-11-compatible software.

This year's Bulgarian exhibit was not so much in the category of hardware as—in keeping with the theme of the fair—in the category of production organization. Therefore, although components and memory technology were certainly included, the emphasis was on networking capabilities of the computers and on CAD/CAM software solutions. Examples include a program system for design and technical preparation for production on the EC 8531.M2 terminal and a technical programming complex for automation of discrete and discontinuous processes named PROCON.

A prerequisite for efficient automation of the production process is the rapid, reliable, and cost-effective development of electronic controls. Consequently, in the next few years the share of application-specific integrated circuits (ASIC's), capable of replacing entire circuit boards, will increase by leaps and bounds. Efficient design systems must be made available for this. Thus, CAD systems are the prerequisite for the development of additional new CAD/CAM systems.

A major representative of the ASIC's is the gate-array IC. The VEB Microelectronics Research Center Dresden offered the programming system ARCHIMEDES for the design of the gate-array system U 5200/5300. With it, efficient circuit designing with short developmental times and a high degree of design reliability is possible interactively making full use of the system. Continuous status data about the current processing status and programming aids as well as numerous properly sequenced test steps are also included in this CAD system.

Input of body lines in a special network descriptor language is a requirement for all additional steps, from preprocessing of text and generation of a network code to static logic simulation, positioning, roughing-in of lines, and dynamic logic simulation all the way to automatic generation of test protocols.

An integrated library of macros contains and documents predeveloped basic circuit elements (physical macros) and their logical, electrical, dynamic, and topological descriptions. Additionally, complex circuits composed of circuit elements such as counters, write registers, or arithmetic units are offered as so-called software macros, with positioning of the individual gates occurring only at the time of the positioning of the entire circuit. ARCHIMEDES runs on 32-bit platforms (e.g., K1840).

The IGT K8919.11 was presented as a new interactive graphic terminal for the Robotron Combine's 32-bit computer series. It includes a graphic processor which manages image storage with 8 storage levels of 1280 x 1024 bits (pixels) each. A serial interface (IFSS/V.24) and a DMA-capable parallel interface are available for connection to a host computer (here the K1840). Serial data transfer rates from 50 to 19,200 baud may be selected. For on-screen display, the terminal has four color systems capable of producing as many as 16 million colors as well as the capability of converting the colors into 256 shades of gray.

Several program systems were demonstrated on the K8919.11, among them the UMSCHA system and the TEXgraf graphic editor.

The UMSCHA program system was developed by the Dresden Technical University to permit evaluation of stresses and deformations such as those occurring with the shaping of doubly curved surfaces in automobile manufacture and shipbuilding and in the shoe and clothing industry. It is also a geology tool. Force and work expenditures at any level of the shaping processes can be determined for elastic, rigid-plastic, and elastic-plastic material behavior. In interactive calculation, shaping processes including consideration of variations in wall thickness and elastic resilience are quickly measured and geometrically edited, with the results displayed graphically. The hardware requirements for the UMSCHA system in FORTRAN are K1840/IGT-2 (K8919) and the SVP 1800 operating system.

The graphic circuit editor TEXgraf from VEB Textimaelektronik is an important tool for the developmental engineer as a component of gate-array design systems. In the age of ASIC's, user-friendly CAD systems assume increasing significance. TEXgraf meets this need through simple operation and a resultant short learning curve. Hierarchical menu interface with many automatic functions in window technology as well as either-way conversion to the alphanumeric descriptive language NBS84 offers good conditions for capturing and modifying circuit plans and for outputting them both on screen and on plotters. Graphic or alphanumeric circuit editing may be chosen; positioning and drawing may be performed by the engineer himself or automatically by the editor.

A resolution of 1280 x 1024 pixels assures good recognition of the circuit elements and symbols. In addition to the comprehensive symbol library which is included, TEXgraf offers the capability of designing user-specific symbols. Circuit testing and representation of simulation results are in among the functions offered such as generation and modification of text, graphic elements, and colors. Within the framework of gate-array design systems such as ARCHIMEDES, the advantages of this graphic editor quickly become evident. TEXgraf may be used in connection with the K8919.11 terminal on a K1840 or a computer compatible to it.

With the transition to series production of the EC 1834, computer-aided development comes increasingly closer to the design workplace. With MultiCAD, the VEB Robotron Combine offers an efficient package developed for the DCP operating system.

Sketches are composed using the graphic elements point, line, circle, arc, strip, plane, text, and symbol; and it is possible, among other things, to alter their position, shape, and number. Sketches can be entered and edited interactively with menu control via both the graphics tablet and the keyboard. For three dimensional display, MultiCAD includes space lines and space planes. The grid models generated are displayed in parallel perspective and may be viewed from different directions.

A version of LISP has been integrated into MultiCAD, which on the one hand actually only contains part of the language range of LISP, but on the other hand has been enhanced by graphics functions. LISP provides the capability of generating user-defined commands and using them as if they were part of the system. For further processing, sketches may be converted into the IGES data format or into a data file.

An example of an optimum configuration for MultiCAD could consist of: EC 1834 (640-K RAM, 2 floppy drives, 1 hard disk, and 1 arithmetic processor), alphanumeric monitor, graphic monitor K7234 (color) or K7229.25 (monochrome), graphics tablet K6405, and plotter K6416.

An easy-to-understand menu and a tablet with pen and magnifier should support user-friendly work with PCCAD, an efficient, two-dimensional CAD system from the VEB Center for Applications Research (LfA) Berlin for 16-bit PC's.

Following a short learning period, manageable and supportive mathematical-geometric functions should assure professional work. The basic geometric symbols, such as point, line segment, arc, and body lines, can be expanded with additional application-specific symbols and can be stored; the basic design functions include connection of points, drawing of tangents, and bisecting of angles—accurately executed and drawn.

Sector-specific modules for mechanical engineering, electrical and electronics engineering, architecture, and geodesy are supplied in addition to the basic module and offer efficient design capabilities in conjunction with the 16-bit PC EC1834 and a color graphics monitor, a digitalized tablet, a plotter, and the DCP 3.2 operating system.

Sketch structuring is possible in as many as 128 levels for structuring, dimensioning, and cross-hatching or shading of a plane.

With CAD/CAM-NILES, the Machine Tool Manufacture Research Center and the Academy of Sciences of the GDR introduced a comprehensive computer-aided system which permits, in addition to design, elaboration of technology all the way to the programming of numerically controlled machine tools for production of bent parts from sheet steel. Increased flexibility and a clear reduction in part cycles with a simultaneous increase in productivity of NC programming and production are the significant performance characteristics. The individual sheet-metal parts may be captured, displayed, and combined as three-dimensional models. Visual control under mounted conditions (as 3D models) and derivation of partial views from the 3D model facilitate the work.

CAD/CAM-NILES permits control, conversion, and acceptance of geometry into the program system for technical preparation for production. The geometry from the CAD system forms the basis for NC programming of the individual parts all the way to automated tool selection and optimization of process technology.

For the design of printed wire boards with the EC 1834, the ZFTN of the Information Electronics Combine (of the LfA) demonstrated the PCLES system. It permits graphic acquisition of the circuit diagram with logic or component symbols and creation of symbol and component lists, of transfer files for the transition to layout design, and of test plots for the circuit diagram. Furthermore, graphic design of the printed wire board profile, component positioning, manual and automatic line drawing in as many as 16 layers (a maximum of 1,900 lines), and output of control data for the light beam sketching as well as for the drilling machine and plotter are possible. The maximum printed wire board size is 65 x 65 cm (with 1/40" raster). The maximum of 511 components may occupy up to 256 pins each. Via connection to a K1840, the specific quantities of parts needed can be loaded to the hard disk of the PC from the uniform component catalog. [passage omitted]

Computer Technology

[Passage omitted] The Yugoslav firm Iskra Delta introduced a new DEC-compatible 32-bit computer in Leipzig. The ADRIA DOA-V31 has a MicroVAX II CPU from Digital Equipment Corporation (DEC), a floating point coprocessor, 1 MByte of RAM, a 335-MByte hard disk, a streamer, and a realtime clock. It was designed for a large variety of applications, such as realtime applications, office automation, and program development. It operates with an expanded Q-bus and uses the UNIX-compatible DELTA/V operating system. The ADRIA may be networked via an Ethernet-Q-bus interface. [passage omitted]

The Elektro-Apparate Werke "Friedrich Ebert" Berlin-Treptow was the first GDR firm to develop, with the P8000 Compact, a microcomputer with the new U80600 16-bit processor system. The P8000 Compact and the U80600 processor system have already been presented in detail in MICROPROZESSORTECHNIK No. 5/89.

TELECOMMUNICATIONS R&D

Czech Telephone Communications Using ROBOTRON Digital PCM 120-1800 Radio Relay System

90CW0017 Prague TELEKOMUNIKACE in Czech No 8, Aug 89 pp 129-130

[Article by Eng Oldrich Sychrovsky, Research Institute of Communications, Prague: "Digital PCM 120-1800 Radio Relay System]

[Text] In conjunction with securing telephone service for the southwestern portion of the city, specifically the settlement of Prague-Luziny, a problem arose involving the manner of connecting the E10 satellite central, located at Luziny in a container with the key central, which is located in the central telecommunications building at Prague-Zizkov. Use of the radio relay system for the wireless transmission of TF channels proved to be a suitable solution. Use was made of the PCM 120-1800 radio relay system produced by the Robotron Enterprise of the GDR, which operates within the bandwidth of 1.7 through 1.9 GHz at a transmission velocity of 8.448 Mbits/s and which, in conjunction with corresponding multiplex devices, makes it possible to transmit 120 TF channels.

The device was installed on a one-skip line with terminal points at the Central Telecommunications Building and at Luziny, in a 2 + 0 system, that is to say, the line has a transmission capacity of 2 x 8 Mbits/s (240 TF channels) with both bundles being operational and a possible disruption of one bundle resulting only in lowering the number of communications lines available between both centrals to 50 percent.

Description of System

The PCM 120-1800 radio relay system works in the 1.7- through 1.9-GHz band at a transmission speed of 8.448 Mbit/s. The digital signal is transmitted with the aid of 4 PSK modulation. The transmitter is modulated in the microwave band, the receiver utilizes coherent demodulation at the mf frequency of 70 MHz. The modulator contains a scrambler which transposes the transmitted signal into a pseudorandom code with a period of 2^7-1 and, thus, prevents the occurrence of discrete maximums in the transmitted spectrum. Demodulation and signal regeneration is accomplished at each relay point. The input and output signal is in the HDB-3 code and has an interface in accordance with the G.703 recommendations of the CCITT.

The radio relay system makes possible the transmission of a single official telephone conversation with the aid of phase modulation of the bit flow of the transmitted digital signal.

The system is further equipped with a simple device for remote supervision, which can serve as many as 11 stations. From each station, it is possible to receive 20 reports. In addition to the reports, it is possible to transmit two commands which are used to switch over to a reserve bundle or to create a loop. The remote monitoring central can be installed separately from the radio relay system, but must, in such a case, be connected to it by a four-wire telephone connection.

The automatic backup device operates in a 1 + 1 system and is not expandable to an n + 1 system. It is also possible to create variants of 1 + 0 and 2 + 0. In the 2 + 0 mode, only the automatic backup device for the service channel operates in the appropriate 1 + 1 system. Backup is not accomplished without a loss of bits. The criterion for switching over is the loss of synchronization, the degradation of the quality of the signal being received (error rate), and a breakdown of the receiver generator. The transmitter for the radio relay system is delivered in three variants with an output of 35.5, 31.5, and 20.5 dBm. The antennas are also provided in three variations, with a diameter of 1.75, 2.5, and 3.5 meters with a gain of 28, 31, and 34 dB. The antennas can be of the dual-polarity type or have only a single polarity with or without a radome.

The frequency plan in the 1.7- through 1.9-GHz band makes it possible to utilize six pairs of channels for purposes of duplex operation. The frequency span of adjacent channels is 14 MHz and all six channels can be united in one antenna having the same polarization. Moreover, it is possible to utilize a frequency plan which is shifted by 7 MHz. The normal and shifted plan cannot be utilized simultaneously for parallel bundles, since the frequency separation of 7 MHz reduces the influence of interference (NFD) by only 5 dB. With a frequency difference of 14 MHz, the NFD is 130 dB.

From the design standpoint, the device is mounted on narrow racks (slim racks) with a height of 2,060 mm, a depth of approximately 245 mm, and a width of 121 mm. One rack can house the transmitter plus the receiver, including a modem and antenna-combining filters. The racks can be mounted back-to-back or with their backs to a wall. To join the device to the antenna, a coaxial cable is used. The power supply for the radio relay system is 48 or 60 V with the positive pole being grounded.

Operating Tests

Following the installation of the device in April 1988, acceptance measurements were conducted at the beginning of May with the participation of the producer. The device was accepted and operational testing was initiated at the same time; operational tests were concluded in November 1988.

Measurements were conducted at the Central Telecommunications Building in Prague and at Luziny. Both bundles were tested for transmitter output and frequency output, the error rate was measured in conjunction with the input level, the resistance of the installation to input jitter and the transmission characteristics of the jitter were also tested.

Apart from the above-mentioned measurements, calibration of the error rate of the transmission from one 30-channel group was conducted (2.048 Mbits/s) in the loop from the Central Telecommunications Building—Luziny—Central Telecommunications Building, which was taken out of service by the Prague Telecommunications Directorate for a period of approximately 3 months.

During operational testing, the breakdown rate of the installation was also monitored.

Evaluation of Operating Tests

The results of measurements obtained during operational testing were compared with permissible tolerances and it is possible to state that all measured parameters fulfill the technical conditions imposed by the producer and meet recommendations of the CCITT with reserves and their stability during the period under consideration can be evaluated as very good.

In contrast to recommendations by the CCITT, the installation has considerable reserves with regard to its resistance against input jitter in the region of 10 Hz to 10 kHz and with regard to the transmission characteristics of jitter in the area of 80 to 400 Hz. Results of measurements pertaining to the dependence of the error rate upon communications attenuation (or upon the receiver level) point to reserves in the range of 3 to 6 dB. These reserves are caused primarily by the lower attenuation manifested by combining microwave filters and as a result of better noise characteristics of the receivers, as well as by higher output from the transmitters in comparison with data contained in the technical conditions.

Evaluation of Results of Error Rate Calibration

In the period from the end of June to mid-September 1988, the error rate in the transmission of one 30-channel group (2.048 Mbits/s) was measured in the loop from the Central Telecommunications Building—Luziny—Central Telecommunications Building, which involved two sets of transmitters and receivers and two second-stage muldexes. From the standpoint of the transmission error rate, the worst period occurred between 1 August and 22 August 1988, when communications showed an error rate within the range of 10^{7} (8.10^{-2} percent of the time) through 7.10^{-6} (3.10^{-4} percent of the time); the occurrence of errors was concentrated in the period from 4 to 7 August and 17 to 22 August 1988. The listed values do not represent a substantial deterioration in the quality of signal and the operations of the Prague Telecommunications Directorate did not record any degradation in quality either. Since the time percentages are disproportionately great to have been caused by leakage and since no errors in transmission occurred outside of these times, it can justifiably be assumed that the errors were caused by exterior disturbances, the origin of which was not successfully identified.

Evaluation of Reliability of the Installation

Reliability of the installation was evaluated on the basis of a review of the breakdown rate, presented by the Regional Directorate for Radio Communications in Prague for the period 13 May 1988 through 31 December 1988, that is to say, for 5,592 operating hours. During this time, the actual installation showed no defect or breakdown, something which, given four sets of equipment, corresponds to an MTBF value greater than 22,000 hours (the ZTP is 59,000 hours).

However, defects did show up with respect to the SVR-1 stabilized power feed sources. Apparently as a result of a deterioration in the filtering characteristics, the feeder current suffers an interfering current at the frequency of the power source converter which results in a deterioration of quality and even the disruption of operations. The described defect showed up a total of four times and caused operations to be interrupted for a total of 21.5 hours.

In anticipation of this defect being eliminated, it is possible to evaluate the reliability of the device as being good on a preliminary basis. Definitive evaluation will have to be made following a longer time period.

Comparison With World Levels

The following facts emerge from a comparison of the PCM 120-1800 radio relay system and similar systems produced by world manufacturers (Teletra, Siemens, NEC) which operate within the same frequency band and at the same transmission speeds:

- The design arrangement and dimensions are at a good level.
- The consumption of electric energy is approximately double.
- The expected reliability of the principal functional components approaches world standards.
- The variability of transmission outputs and the assortment of antennas facilitates flexible adaptation to design requirements. However, the antenna assortment is lacking quality types of antennas making possible the solution of difficult frequency areas.
- The noise numbers of the receiver and, thus, the threshold level are worse by 3 to 4 dB.
- The attenuation of the antenna feed over a distance of 100 meters (coaxial cable) is greater by 13 to 14 dB.
- The temperature range of the operating environment corresponds to the world status.
- Automatic backup operates only within the 1 + 1 system and results in the loss of transmitted information during switching. This system is ineffectual from the standpoint of utilizing the frequency spectrum where multiple-parallel bundles are installed.
- Minimal frequency span between parallel mode bundles is 14 MHz. Current peak systems make possible a spacing of 1.75 MHz at reverse polarity and 3.5 MHz at identical polarity, so that the utilization of the spectrum is eight times greater.
- The majority of producers manufacture a system of this type in modular form, making it possible to select transmission speeds of 2, 2 x 2, 8, 2 x 8, and 34 Mbits/s.

Utilization of the System as Part of the Unified Telecommunications System (JTS)

In view of the transmission capacity (120 TF channels), the emphasis on utilization of the PCM 120-1800 system will be in transit networks and in the central network.

On the basis of a proposal for a national model of a digital transmission network, it is expected that the length of communication in the transit network will not

exceed a distance of 100 km and will be established at a quality level of X3 according to recommendations by the CCIR. In the central network, it is possible to build communications systems over a distance of 50 km at a quality level of X4. The installation can also be used in the intertransit network at a quality level of X2 in sectors which will not be part of the international transit communication and it is necessary to keep in mind that the backup system operates with a loss of the transmitted information. It is even possible to achieve a quality level of X1 while adhering to appropriate principles of designing (primarily by shortening skip distances).

From the standpoint of the optical utilization of the system characteristics and the efficient utilization of the frequency spectrum, it is recommended that the following principles be adhered to:

- Realization of the dual frequency plan is possible only with an antenna having a diameter of at least 2.5 meters at an angle between adjoining skips running between 100 and 170°. Prerequisites for this are approximately equal attenuation and level conditions of both skips.
- In view of the unsuitable radiation diagram of an antenna with a diameter of 1.75 meters, it is recommended that it be used only for terminal stations where no further communications are even anticipated in the long run in the 1.8-GHz band and where there is no danger of mutual interference.
- In the event more parallel facilities are built, the 1 + 1 backup system is uneconomical from the standpoint of utilizing the frequency spectrum. It is recommended that priority be given to building a system of a higher order (for example, 34 Mbits/s) in the interest of conserving the spectrum and that the use of second-order systems be reserved for branching locations.
- The 2 + 0 system should be used. In connecting to digital centrals, which are capable of finding a free path (for example, the joining of the control facility and the E10 satellite central), this system is suitable because it doubles the transmission capacity and a breakdown of one bundle only results in temporarily reducing the number of communications lines to 50 percent.

In the course of operating tests, the PCM 120-1800 radio relay system proved itself completely. Its assembly is not more complicated than that of other radio relay systems and can be handled by Czechoslovak assembly organizations. It will find application particularly in transit and central communications.

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GDR's Proposed Multifunctional ISDN Terminal Described

23020088 East Berlin NACHRICHTENTECHNIK-ELEKTRONIK in German No 8, Aug 89 pp 228-290

[Article by D. Carl: "Multi-Function ISDN Terminal Concept"]

[Text] **1. Objectives**

Multi-function terminals occupy a special position among ISDN terminal equipment. They allow the most economical use to be made of all of the features of an ISDN, and also present a number of advantages over single-function terminal equipment.

A multi-function ISDN terminal supports applications which are based on differing information media (voice, text, data, artwork). An ISDN terminal brings together applications which are founded partly in telecommunications and partly in information processing. A unified user interface integrates these applications into a unified system. Studies of the principles involved in the design of multi-function terminals are complex in nature, and must be initiated early on. Current research is geared toward a study of the unification of 3 classes of service in one terminal:

- Telephone service
- Message exchange.
- Fast data exchange.

Among other things, this design requires a study of the following areas:

- Multi-function terminal architecture
- Incorporation of power feed capability
- Implementation of D-channel user packet data transfer
- Appropriate additional service features
- Protocols for B-channel data exchange, and
- Adaptation to an ISDN of existing applications, in particular OSI-compatible applications.

A study of the above must involve not only the connection of terminals to ISDN circuit-switching exchanges, but also the direct connection of the terminals without an exchange (similar to the way in which LANs operate). Such studies are based directly on the results achieved in the establishment of a model ISDN telephone system. The system is to be designed around a commercially available PC (EC 1834) expanded to incorporate additional hardware and software.

2. Basic Architecture

To allow multiple-use of certain subordinate functions and to achieve sufficient flexibility for further development, a modular multi-function ISDN terminal design is

the optimum approach. Fig. 1 illustrates one possible basic logical design in the form of a simplified SDL system diagram.

The heart of the system is the IAU ISDN access unit through which the applications are coupled to a typical ISDN subscriber network interface. The access unit consists of the following components:

- The ISDN interface controller (IIC) which performs the functions of the physical transfer layer
- The ISDN link controller (ILC) which performs the functions of the data link layer, and
- The ISDN network controller (INC) which performs the functions of the network layer (signaling)

The telephone component (the existence of which is always assumed) is viewed as an autonomous module due to the power feed capability requirement. Under conditions of normal operation, however, this function is fully integrated into the entire multiple-service concept. The applications are brought together in the applications unit which is linked to the IAU via the transfer layer. The applications to be offered are of different types, and OSI-compatibility is assumed. A service control component invokes ISDN network layer functions to coordinate either consecutive or simultaneous use of applications.

An effective way of implementing multi-function ISDN terminal systems consists of the combination of a PC with a digital telephone system; both are linked via an IAU to the S_o or U_{po} ISDN interface.

There are three different types of PC-digital telephone systems:

- Digital telephone with integrated V.24-TA with a PC connected via the existing V.24 interface. Advantage: Data communication applications can be implemented relatively simply and quickly. Disadvantage: Minimum V.24 data transfer capability, insufficient use of potential ISDN features, no integration of voice and data communications.
- ISDN access unit as separate device which can be connected to a digital telephone and a PC. Advantage: A number of different applications are possible. Disadvantage: Additional set-up space, components and cables required.
- PC with digital telephone connected as an ISDN expansion module (IEM) of the PC. Advantage: Good potential for the integration of voice and data communications (multi-function system), and maximum utilization of B-channel potential. Disadvantage: System is more dependent on the PC, implementation of the telephone function is more complicated.

This last system would appear to be the most promising for development of multi-function terminals.

3. How the Network Level Operates Within a Multi-Function ISDN Terminal System

Most of the ISDN functions within a multi-function terminal system are implemented by the INC (ISDN network controller; see Fig. 1). The following discussion concerns several of the new problems which must be solved with regard to multiple terminal functions:

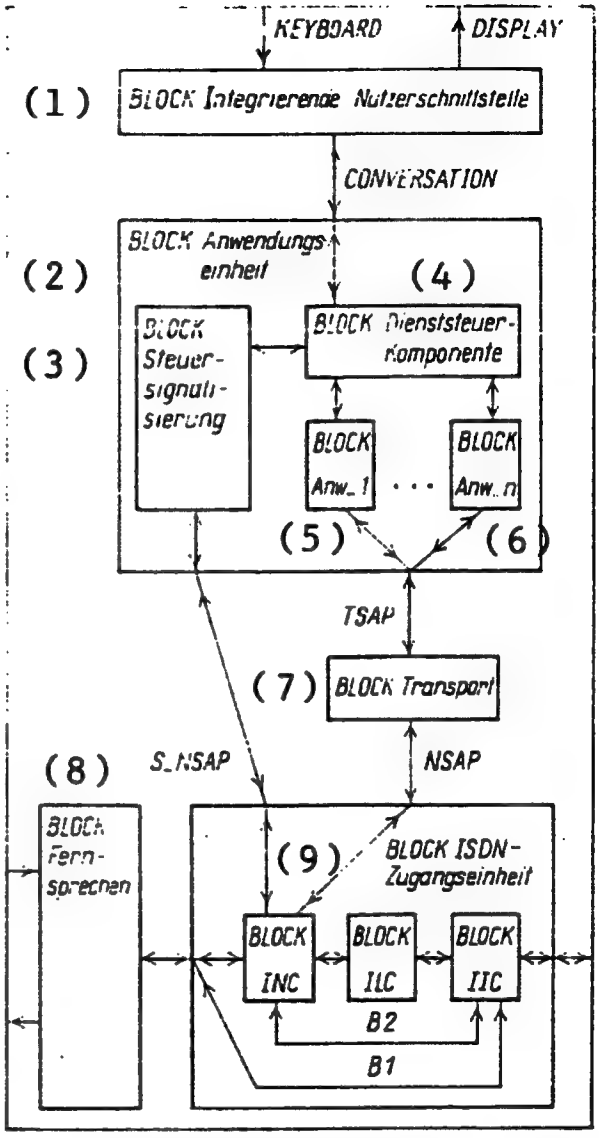

Figure 1. Simplified SDL System Diagram of a Multi-Function ISDN Terminal (signals not shown—not all channels labeled).

Key:
1. Integrating User Interface Block
2. Applications Unit Block
3. Control Signaling Block
4. Service Control Component Block
5. Application 1 Block
6. Application n Block
7. Transport Block
8. Telephone Block
9. ISDN Access Unit Block

information be included in the corresponding signaling messages (in particular in the SETUP message), and vice versa. The interface through which the transfer services (ISDN network service) offered by the ISDN system are implemented, however, must be defined such that it is independent of application. The conversion of information, as well as the encoding and decoding of service-specific information, must therefore be performed at the network layer.

An example is the selection of the type of link used for data exchange: At the calling end, the ISDN network service primitive N-CONN-req is used to transfer to the network layer suitable information which indicates the type of link, which is then encoded in the SETUP message.

- On receipt of a link set-up message a determination must be made as quickly as possible as to whether the requested service is available via the terminal (compatibility check). In order to shorten the amount of time required to establish a link, this check should be performed without recourse to layers 4 through 7. Performance of this function should be incorporated into layer 3, and within the management component within this layer. The principles required for this configuration (e.g. the use of a local directory at layer 3, the incorporation of system management according to the OSI management framework reference model) are still to be investigated in detail.
- Multi-function operation of the terminal requires that the signaling and user-data links be operated in parallel on the D channel. However because user-data links are established and released together with signaling links, the coordination of parallel links among one another is also required. Effective solutions must be found to these problems.

The problems outlined above clearly indicate that the network layer in particular must meet a whole new basic range of requirements different from those encountered in traditional communications systems due to the higher quality of ISDN functions. There is also another range of functions which, at least in part, have been implemented in other types of networks, such as

- Multiplexing several signaling links and several packet data links on one layer-2 link each for signaling and packet data, and
- Segmenting or blocking of layer-3 protocol data units.

Figure 2 depicts a rough outline of a possible network layer structure in a multi-function ISDN terminal.

4. Design Approaches

4.1. General Principles

Following the evaluation of the different terminal designs presented in Section 2, we can now select a basic architecture design for a multi-function terminal which comprises a PC connected to a telephone. The functions are distributed as follows:

Only local functions are implemented in the telephone, such as tone generation, tone amplification, keyboard handling and hook contact recognition. CODEC, filters and the telephone logic software are contained in a remote complex and are fed to the telephone from the PC.

D-channel packet transmission is to be investigated for message exchange. The method used is standard inband signaling (on the D channel); ISDN access is adapted to OSI-compatible applications via a transport layer which provides the OSI transport service.

Fast data transfer uses the B channel. Here, it must be determined whether or not data transfer is possible in layer 2 with a LAP-D protocol and without a layer-3 protocol. In this case it must be ensured that the establishment and release of network links is supported by the D channel, and that data transmission is supported by the layer-2 protocol of the B channel.

Within the PC, the functions are distributed as follows:

Hardware and software for processing D- and B-channel protocols and for implementation of the transport layer

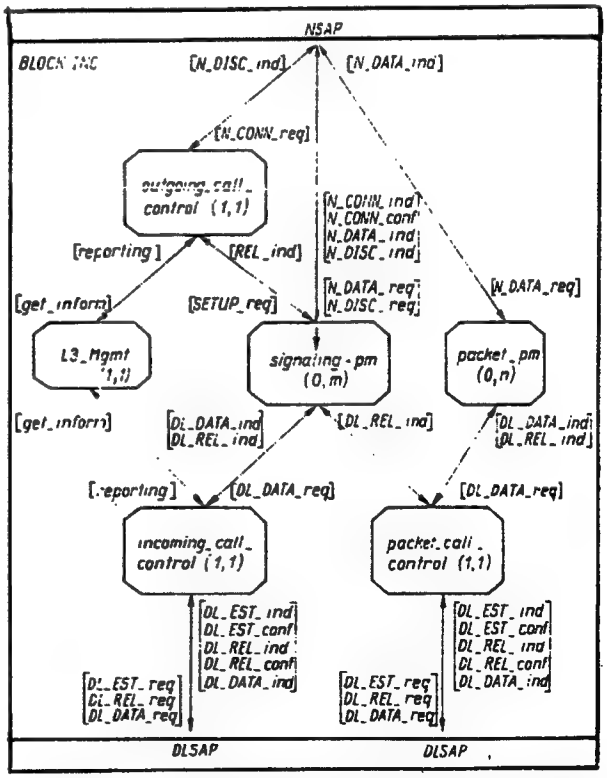

Figure 2. Rough Outline of Possible Network Layer Structure in a Multi-Function ISDN Terminal (showing SDL/GR).

and the telephone function are contained in a separate module (ISDN expansion module) as an expansion assembly. A new driver allows the transport service to be implemented as an operating system function.

4.2 Structure of the ISDN Expansion Module (IEM)

The design of the module hardware is based on the following principles:

- The incorporation of the IEM into the PC must be flexible and adaptable to a number of different operating environments.
- The proposed range of functions requires the use of a 16-bit microprocessor and at least 256 KB of memory.
- The basic telephone functions, including the necessary ISDN signaling, are implemented using a separate 8-bit microprocessor (most likely in CMOS technology) in order to meet the requirement for power feed capability.
- In the standard operating mode (AC line power supply), full ISDN signaling capability also supports the telephone function.
- It should be possible to design the ISDN interface as either an S_o or a U_{po} interface.

In consideration of the above descriptions, the modules can be separated according to function as follows (see Fig. 3):

- The PC interface module, which supports the incorporation of the hardware and software of the expansion module into the PC, is operated as a slave on the bus, whereby both the interrupt and DMA operating modes should be investigated.
- The telephone module (based on the U880 with either 32 or 64 KB of ROM) has complete power feed capability and implements limited (layer-3) D-channel signaling as well as the telephone logic.
- The CPU (based on the 16-bit processor in the 8086 family with 256 KB of memory which can be loaded by the PC) universally implements (layer-3) D-channel signaling, including the additional service features, as well as lower-level B-channel protocols and the transport-layer protocols.
- The ISDN interface module, which is responsible for processing the LAP-D protocol as well as the implementation of the S_o or U_{po} interface.

The modules described above communicate with one another via defined interfaces which makes them highly adaptable and easy to expand.

5. Concluding Remarks

Due to the positive experience gained using SDL-supported software technology, work has begun on preparation of an SDL specification for an initial version of the multi-function terminal described above based on the PC EC 1834/35. Already-existing functions are used for PC-based data communications, such as file copying.

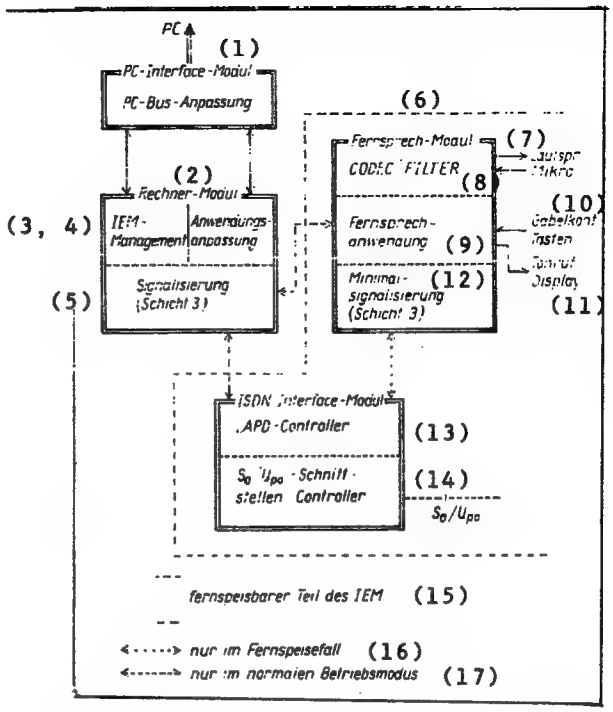

Figure 3. Rough Outline of the ISDN Expansion Module.

Key:
1. PC Interface Module PC Bus Adaptation
2. Computer Module
3. IEM Management
4. Adaptation to Applications
5. Signaling (Layer 3)
6. Telephone Module
7. Speaker Microphone
8. CODEC/FILTERS
9. Telephone Application
10. Hook Contact Keys
11. Incoming Call Ring Display
12. Limited Signaling (Layer 3)
13. ISDN Interface Module
14. S_o/U_{po} Interface Controller
15. Remote Power Section of the IEM
16. only in the case of remote power
17. only under normal operating conditions

The current state of the art was reflected in the oral presentation given in Mittweida. NaA 166

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Status, Development of CEMA Data Bank/Data Communications Network

23020082 East Berlin INFORMATIK in German
No 3, Mar 89 pp 88-93

[Article by Rolf Schoenfelder of the Central Institute for Information and Documentation: "Status, Development of CEMA Data Bank/Data Communications Network"]

[Text] **Introduction**

The establishment of a CEMA data bank and data communications network, which is currently in an experimental phase of operation, is part of the development of CEMA's International System for Automated Information Exchange (ISAI: Internationales System fuer den automatisierten Informationsaustausch), which itself is part of the CEMA slate of programs of scientific and technical advancement to be implemented by the year 2000 (Task 1.2.1 of the primary direction "Electronic Development of the National Economy"). A multilateral agreement in this regard was signed in 1986, in which the GDR is also taking part as the result of a government resolution [1].

The databases available for on-line, interactive research were either developed in the GDR, were the result of a multilateral cooperative effort among the CEMA member nations (e.g. as a product of the International System for Scientific and Technical Information [ISWTI: Internationales System fuer wissenschaftliche und technische Information]), or were a product of the resources of the non-socialist economic sector. These databases are accessed via a packet-switched data network which, in the course of its further development, will be increasingly supported by the national data networks still to be established.

The GDR is participating actively in the above-mentioned areas. As early as 1986, decisions were made concerning the facilities in which largely on-line databases would be established for use by the other CEMA member nations, or which would be subscriber points for access to CEMA data banks [1, Appendix 1]. In 1988, a further resolution was introduced [2]; this resolution, based on initial positive results, regulates basic economic, commercial and technical-organizational conditions for broad participation by institutions in the GDR in the exchange of information not only with CEMA member nations, but also with the non-socialist economic sector.

The above-mentioned resolutions also stipulate that the ZIID [Zentralinstitut fuer Information und Dokumentation—Central Institute for Information and Documentation] is to be the national coordinating body responsible for the ISAI agreement; these resolutions also stipulate that the master terminal for international automated information exchange (hereinafter called "master terminal") is to be set up for the practical handling of data traffic. This was done in 1986. The master terminal is also responsible for the technical control of data traffic until the international data switching center goes on line in the yet to be established automated data network of the German Postal Service.

1. Structure and Functions of the Data Bank and Data Communications Network

1.1. Overview of Structure and Functions

The schematic structure of the CEMA data bank and data communications network shown in Fig. 1—hereinafter called simply the "network"—incorporates the elements and functions explained in Table 1 in its present stage of development.

In the following Sections 1.2. through 1.5., only those structural elements and functions of the network are described in detail which are of direct significance to the user in the GDR in carrying out interactive research in the CEMA data banks.

1.2. CEMA Data Banks

At the present time, the user can choose from among 116 databases in 14 data banks provided by six CEMA member nations and the ISWTI; among these 116 databases are 109 bibliographical and 7 fact-based databases with a total of roughly 10 million individual pieces of information which can be remotely accessed for the performance of interactive research. The resources made available by the GDR in this regard are not taken into consideration, because these resources do not cover access to GDR data banks from outside the country. As shown in Fig. 1, data banks in the People's Republic of Poland and the Hungarian People's Republic cannot currently be accessed via the central node in the VNIIPAS, but rather only via telephone circuits after previous agreement.

The majority of the CEMA data banks are described in detail in the database catalog published by the ISWTI [3]. Table 2 lists the available data banks arranged according to country, and also gives information on the types of database computers used as well as on the information research systems.

The data banks are available during one shift either every day of the week or only on certain days. Consult the schedules for the exact on-line times. However not all databases are available during scheduled periods of time; availability is determined by demand and external storage capacity, which often is not sufficient to make available complete, comprehensive resources. These are then made available on a time-share basis, with more limited research depth. For this reason, the exact times at which databases will be available is to be taken from the updated schedule.

1.3. GDR Network Connection Nodes within the ZIID

The GDR has been connected to the network since 1986 via the network node set up in the ZIID master terminal

and the four-wire point-to-point circuit connected to the VNIIPAS in Moscow. The heart of the node is a PAD (packet assembler/disassembler) terminal unit which allows up to four remote data connections between the users and suppliers of data banks both inside and outside the GDR or to the central telecommunications services in VNIIPAS to be switched and monitored simultaneously and independently of one another on-line via the existing point-to-point circuit (concentrator function). The PAD performs packet switching (cf Section 1.5.) in accordance with CCITT X.25 protocol [4] (CCITT = Comite Consultatif International Telegraphique et Telephonique) for asynchronous data links with terminals and data banks (referred to generally as data terminal equipment or DTE) which use the start-stop transmission method. The serial characters are converted, or back-converted, to the packet format (conversion function) using the CCITT X.28 protocol [5]. Data transmission links set up by the German Postal Service are used to connect remote DTE in the GDR to the PAD equipment in the ZIID (cf also Section 2.1.).

The principle used to switch remote user access to the on-line data banks within the GDR and abroad via the ZIID master terminal is illustrated in Fig. 1.

1.4. User Subscriber Points

As already discussed in Section 1.3., remote access is provided to CEMA data bank users through the node in each user's country via specially-equipped subscriber points (AP) with the following recommended basic equipment:

- DTE (video terminal, personal or office computer) for entry and output of Roman and Cyrillic characters;

- a modem as a data transmission device;

- connection to a transmission link set up by the German Postal Service;

- a printer capable of printing Roman and Cyrillic characters.

The AP must use the start-stop transmission method with the following transmission parameters:

Type of transmission: asynchronous, one character at a time;

Mode of operation: full duplex. Duplex operation is necessary so that the PAD can transmit status signals or control characters, e.g. X-ON/X-OFF) to the DTE at any time;

Table 1 - Network Structural Elements and Their Functions

Definition of Element	Explanation	Functions (Services)
distributed databases	in 7 CEMA countries and in the IZWTI	support of interactive comm., provide research results and orig. doc. (copies)
central telecom. services	in the VNIIPAS	INFOSERVICE, E-mail, ADONIS teleconf. syst., KERMIT data trans. service, etc.
cent. netw. switching node	in the VNIIPAS (also natl. packet-sw. node of USSR)	packet and circuit sw. for all netw. data traffic, access to data banks and services (INTERKOM syst.)
national conn. nodes for packet sw.	in 6 countries incl. GDR, (in the ZIID master term.)	packet-sw. access to netw. for national users and data banks via pt.-to-pt.-circui
subscriber pts. for start-stop op.	in all CEMA countries	research workstations w. req. hardw. and softw. for interact. searches

Remarks: The People's Republic of Poland, the Hungarian People's Republic, the Socialist Republic of Vietnam and the Socialist Republic of Romania do not yet have access to a connection node for packet switching, and instead access the network via telephone lines (cf also Fig. 1).

Transmission method: start-stop procedure, using the following parameters: 7 data bits, 1 stop bit, even parity for the check bit, and a data transmission rate of 300 or 1200 bits per second;

Transmission code: expanded ASCII code for the transmission of Cyrillic characters (cf [6], p 103)—lower-case Roman characters are replaced by upper-case Cyrillic ones.

1.5. The Packet Switching Function

Network data traffic is based on the principle of packet switching. In contrast to circuit-switched data transmission, data transmitted using the packet-switching principle does not arrive as the primary transmitted or received series of characters, for which a continuous (permanent) link between sender (e.g. a data bank) and receiver (e.g. a researcher) is required, but rather in the form of packets via a virtual (not necessarily continuous) link. Packet switching requires that the string of characters sent by the DTE be broken up into groups, which are then reassembled when they are received. This function is performed by the PADs in the network nodes (see also Section 1.3.). A (data) packet is a fixed-length series of characters (usually 64 or 128 bytes) which is handled as a unit, and which contains control commands and a destination address. In contrast to circuit switching, packet switching allows the data transmission links (channels) to be utilized significantly more efficiently, because several users, or resources, can be handled simultaneously by one channel, whereby the packets can be placed in intermediate storage and routed to their destinations along different paths.

In the present phase of development of the ISAI, packet-switching technology is still in its infancy for several

reasons. First, the communication network has a star-shaped structure. Access to the data banks and telecommunications services is therefore only possible through the central node in the VNIIPAS (the control-coordinating unit of the ISAI). Alternative paths (network connections) do not exist, which means that a number of advantages of packet switching technology—optimization of packet transport (routing), avoidance of overloads and thus high transmission stability—cannot be realized at the present time. All packets are transported via one node (the central node), which at times of peak traffic load can lead to node overload (network congestion) as well as interference and interruptions in the flow of data (clear code messages). Secondly, the CEMA data banks—with the exception of those in the People's Republic of Bulgaria—are not connected to the network via X.25 links, but rather via telephone data links utilizing the X.28 protocol. These problems will be solved step by step as national packet-switching data networks are established in the individual CEMA member nations.

2. Use of CEMA Databases through GDR Equipment

2.1. Technical Requirements for the Subscriber Points

a) Data terminal equipment The following 8-bit devices have been tested and used in the GDR to date for the subscriber point DTE:

- PC 1715 personal computer (Robotron) - A 5120/30 office computer (Robotron) - VDT 52106 monitor (Videoton, People's Republic of Hungary)

Table 2 - Summary of CEMA Data Banks (excluding the GDR)

No.	Country	Name/Operator of Data Bank	No. of Resources	Data Bank Computer	Info. Research System
1	-	IZWTI	17	EC-1055M	DIALOG-2
2	USSR	VINITI	56	EC-1055M	POISK-1.2
3	USSR	INION	12	HP-3000	POISK-4M
4	USSR	GPNTB	4	EC-1060	CDS/ISIS
5	USSR	NPO "POISK"	1	EC-1055M	SPEKTR
6	USSR	IVTAN	1	HP-3000	BANK
7	Bulgaria	ZINTI	11	IBM-4341	STAIRS-VS
8	Cuba	IDICT	3	EC-1035	CDS/ISIS
				ND 100/CX	MINIMAX
9	Poland	Institute for Iron Metall.	1	*)	*)
10	Poland	Committee for Standardization	1	*)	*)
11	Poland	Central Agr. Lib.	1	*)	*)
12	Czechoslovakia	UVTEI-UTZ	4	SIEMENS-7755	GOLEM, SESAM
				EC-1055M	DIALOG-2
13	Hungary	OMIKK	2	EC-1036	CDS/ISIS
14	Hungary	VEIKI	2	IBM-4341	STAIRS/VS/CDS/ISIS

*) precise information not available

Table 3 - Modems Used in the GDR for Remote Access to Foreign Resources

Model	Manufacturer	Transmission Rate	Permitted for
VT 60005	VIDEOTON (Hungary)	300 bits/s	publ. tel. netw.; manually switched data netw.
AM 12-TD/S*)	ORION (Hungary)	600/1200 bits/s	manually switched data netw.
MD-101	Funkwerk, Leipzig (no longer manuf.)	200 bits/s	publ. tel. netw.
MPS 3021	Racal Milgo (GB)	300 bits/s	publ. tel. netw.; manually switched data netw.

*) Modem also capable of synchronous operation (via switch on front panel).

This equipment was supplied on request with Cyrillic and Roman character sets, including the necessary fonts and appropriate keyboard. If only a Roman character set is available, it can either be exchanged by the user for a mixed-character keyboard, or a mixed keyboard can be added if there is a socket available for the additional

EPROM (PC 1715). Of course, the mixed Cyrillic-Roman character set is only necessary if the user wishes to access Russian- or Bulgarian-language databases.

As opposed to the Hungarian terminal (EC 8570) which uses a start-stop hardware configuration, the parameters of which can be set on the unit via the corresponding switches, software-driven personal and office computers offer the additional advantage of being able to save database information to diskette and send and receive files. The program TLC [7] offered by the Bueromaschinenwerk Soemmerda [Soemmerda office equipment factory] is available for this purpose. The specific parameters for the start-stop protocol can be entered via a menu and stored. The next step is to call up the subprogram TALK at the terminal. Versions of TLC for other 8- and 16-bit equipment developed by Robotron are also available.

In general, it should be determined before the DTE is used whether asynchronous, full-duplex operation is supported. Any settings which need to be changed should be changed by a service technician in accordance with the equipment documentation, which provides additional detailed information.

b) Data transmission equipment (modems) Only asynchronous, full-duplex modems can be used in conjunction with the two-wire transmission circuits provided by the German Postal Service (see Item c) under the start-stop conditions explained above (see Section 1.4.). Any modem connected to the DTE at the AP must be compatible with the modem for the PAD terminal equipment in the ZIID. Table 3 below lists several types of equipment used in the GDR to access terminals in other countries. Of the equipment listed, models VT 60005 and MPS 3021 are the only different modems which are mutually compatible. As far as the other models are concerned, the two communicating modems must be of the same type.

c) Data transmission links provided by the German Postal Service Data transmission between the remote DTE (AP) and the PAD terminal equipment in the ZIID takes place over data transmission links established by the German Postal Service. In the GDR, data transmission can use the telephone or telex network, leased lines or the manually switched data network (HDN) specially established by the German Postal Service for data traffic. After leased lines, this last type of link offers the highest-quality service. Connections must conform to the appropriate regulations of the German Postal Service [8], and are installed by them.

2.2. Methodological Requirements for Interaction with a Data Bank

Among the requirements for the use of data banks and telecommunications services is precise knowledge of existing documentation which explains the content and structure of the resources as well as the command language to be used. Several sources of information in the GDR on the most-used interactive search systems, the DIALOG-2/VS and the POISK-1.2., are listed in the bibliography [10-18]. The ZIID will provide additional expert information and support on request. In 1989 the ZIID will publish a handbook for international remote data access as a self-contained methodological reference (Order No. 405).

2.3. Organization of Data Bank Use

Interactive searches of the CEMA data banks by GDR institutions are organized in conformance with the tasks contained in the plans for scientific and technical information of the economic sectors. These databases can be directly accessed via the user's own equipment, via the AP in the ZIID or using other equipment in the user's country. Such use is based on agreements reached between the ZIID and the State agencies, combines, enterprises and research institutions at their request. The ZIID provides the user with all necessary technical support concerning how to access a remote database. The ZIID also prepares instructional materials and holds training courses in this regard.

The planning, organizational and economic conditions for international database access, including questions of foreign trade, are regulated by the appropriate centrally-established requirements (cf also Section 3.2.).

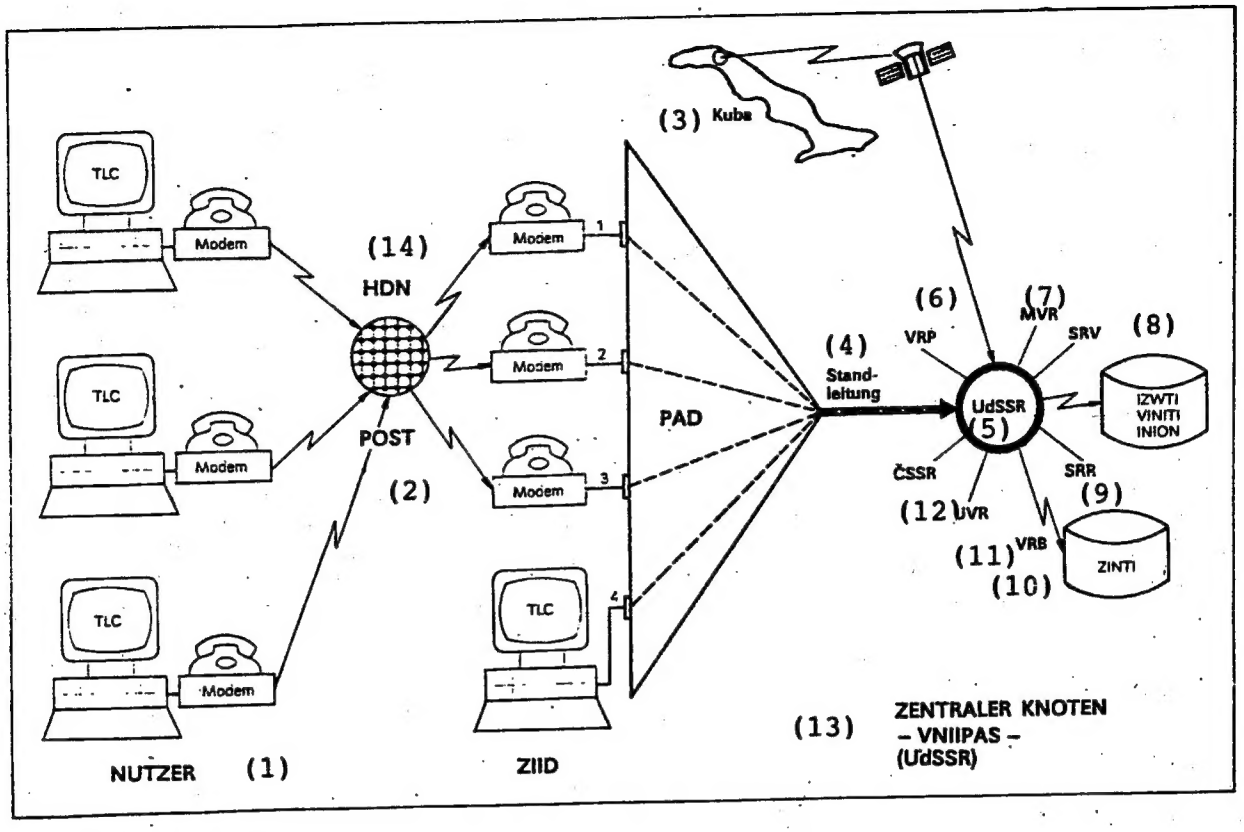
The use of data banks is still experimental in nature, and for this reason the majority of data bank operators have made their resources available at no cost (cf also Section 3.2.).

The time at which these data banks are accessed and the amount of time a user stays on-line are freely selectable by the users themselves within the overall agreed-upon limits, however users must accept the possibility of scheduling changes due to operating requirements, as well as any database channel availability constraints. At peak traffic periods, users may be required to wait for available channels, i.e. several attempts may be necessary before a user can connect with the desired data bank.

2.4. Status and Results of Data Bank Use

Widespread use of on-line information resources offered by the CEMA member nations utilizing a new, proven technology was ushered in when the connection node discussed in Section 1.3. was placed into network service in the master terminal of the ZIID. Previously, it had been possible to access foreign databases only via telephone lines which were susceptible to interference. This arrangement, which was agreed upon together with the GDR Ministry for Post and Telecommunications, has accelerated by four years the scheduled availability date of the German Postal Service's packet-switched data network for remote database access currently under construction.

In addition to the ZIID, the initial users in the GDR, who began to test the new access parameters beginning in 1987, were the Scientific Information Center of the



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Struktur des Datenbank- und Datenkommunikationsnetzes der RGW-Länder

Figure 1. Schematic Structure of the CEMA Data Bank and Data Communications Network

Key:—1. USER—2. POSTAL SERVICE—3. Cuba—4. Point-to-Point Circuit—5. USSR—6. People's Republic of Poland—7. Mongolian People's Republic—8. Socialist Republic of Vietnam—9. Socialist Republic of Romania—10. People's Republic of Bulgaria—11. Hungarian People's Republic—12. Czechoslovak Socialist Republic—13. CENTRAL NODE - VNIIPAS - (USSR)—14. Manually switched data network

Academy of Sciences, the Invention and Patent Office and the VEB Zentrale Informationsverarbeitung Chemie (Central Information Processing, Chemistry); at the present time there are already a total of 25 participating institutions, including nine which have no AP of their own, and are using interactive workstations together with the ZIID at that institution—a form of usership which is gaining in significance in other administrative areas as well.

At the present time, development involves only data banks in the USSR, the People's Republic of Bulgaria and the ISWTI. Access to the resources of other countries has not yet been investigated due to content, language and technical problems.

Those data banks being used are the GDR's own data banks on a national level or those established through cooperative effort among the CEMA member nations, such as (data bank operators given in parentheses)

- selected bibliographic data resources (VINITI) corresponding to the "journal of abstracts", - a resource for documenting analog patents (NPO "POISK"), - MSIS NIR - CEMA scientific research (IZWTI), - MEDIK - medicine (ZINTI).

Also included are international non-socialist resources such as

- INSPEC - physics, electrical engineering, computer engineering (IZWTI, ZINTI), - BIOSIS - biology, biotechnology - (ZINTI), - COMPENDEX - engineering/technology - (IZWTI, ZINTI), - PROMT - economic data, market and technology - (IZWTI) - EMIS - data on materials used in electronics - (IZWTI, ZINTI).

In 1988 the above data banks and data resources supported roughly 800 interactive log-ons for research purposes. In addition, the institutions made increasing use of centralized telecommunications services such as the teleconferencing system ADONIS, electronic mail and the information service INFOSERVICE. The connect time for use of these services, which was provided through the master terminal, was approximately 900

hours in 1988. In spite of a number of problems which had yet to be resolved, the users gave a positive evaluation of the results of their research. Connect time was used to provide the users with information on planned R&D subjects and basic research tasks, as well as for checking and adding to the information gained by researching national data resources. The Carl Zeiss combine in Jena, for example, was able to support its R&D work on the topic of YAG lasers, and the Invention and Patent Office was able to eliminate duplicate registrations of GDR patents using interactive patent research methods, and the information acquired by the Institute for Scientific Information in the medical field of inner ear transplants was put to use in medical research done by Charite Berlin.

As a result of the experimental nature of data bank research and packet switching technology already discussed above, the effectiveness of remote data access does not yet compare with that offered by non-socialist data bank and data communications networks. Malfunction-caused downtimes in 1988 reached nearly 50 percent of the above-mentioned connect time in both areas, and resulted in on-line sessions which were too long. It takes even trained persons an average of 30 to 40 minutes or more to research a database, however blocks of continuous research time of 10 to 15 minutes must be attained. Research work has also been lost when, following reestablishment of a connection lost through malfunction, research cannot be continued at the point at which it was interrupted, and must be repeated. An additional problem is the fact that researchers have suddenly found themselves in areas other than the ones in which they were doing research. These problems all lead to unjustified or incorrect charges for time used.

In this regard, the ZIID has undertaken extensive quality analyses in the past several months, and has taken steps in the direction of international cooperation to noticeably improve quality.

Experience gained to date in the experimental use of the above-mentioned information resources can be summarized as follows:

1. The decision to allow direct access to CEMA information resources must be carefully studied in terms of economic criteria based on an evaluation of the concrete need to know. If a researcher does not use a data bank for at least five hours per month—this amount of usage represents five to ten log-ons—then the researcher is considered unable to meet the technological and informational requirements and gain the knowledge required for interactive use to the extent necessary for successful research in the data bank in question. This requirement is to be applied more strictly if research is to be done in several resources which are different in terms of research method and information content.

2. Remote access to international databases requires self-study techniques and thorough methodological training of the researchers months before the first research session, as well as specific qualification in order to provide more well-founded knowledge. This pertains not only to the questions involved in the research itself, but also to the content and methods of accessing specialized databases as well as mastery of all of the details of telecommunications equipment operation which are involved in an research session, including proper use of telecommunications software.

3. Each research session must be preceded by extensive preparation; the amount of time required for this can amount to two thirds or more of the total amount of time required for the research task.

4. The currently high percentage of data bank operating system and telecommunications system malfunctions requires that the proper procedure in the event of malfunction be learned. Through close cooperation between the remote user, the master terminal, the VNI-IPAS operators and within the data bank in use at the time, malfunctions during on-line research can be countered more easily and effectively. Nevertheless, the operating technology must be improved in order to ensure stable operating conditions.

2.5. Development Prospects

The CEMA data bank and telecommunications network has withstood its "trial by fire." Experimental operation is continuing, with the objective of automating and stabilizing the system under conditions of continuous operation by the year 1995, so that it will be able to offer a wide variety of data banks and telecommunications services developed between and coordinated among the CEMA member nations. These resources can be implemented through the use of automated conventional systems within a telecommunications network defined by a clear topology, which employs state-of-the-art packet-switching technology, and which supports full integration of those national data networks developed up to that time.

By 1990/1991, the number of hours of connect time provided via the master terminal for mutual remote data access, as well as the number of domestic users of all data banks and foreign users of GDR data banks, are expected to increase by a factor of approximately five over current usage figures. This includes the possibility of connecting to Western data networks. The procedure used in the master terminal of the ZIID for controlling the international automated exchange of information is to be further stabilized, and brought to a level of development which will allow it to handle the GDR's scientific and technical information requirements from a technological standpoint until 1991, at which time the international data switching terminal of the German Postal Service's packet-switched data network is scheduled to go on-line.

Management, planning and economic measures as stipulated in Resolution [1] (see Section 3.1.) for the use of CEMA data banks are to be implemented and brought to completion.

3. Legal and Economic Foundation for Use of the Data Bank and Data Communications Network Established by the CEMA Member Nations

3.1. Resolution on participation of GDR institutions in the international automated exchange of information, dated 26 February 1988

This resolution, as introduced by the Council of Ministers of the GDR, includes the following:

- the "directive regarding participation by the CEMA member nations in the international automated exchange of information;"

- the "regulations for participation by the CEMA member nations in the international automated exchange of information;"

- the "stipulations for direct access to data banks in the non-socialist economic sector, as well as access to GDR data banks by non-socialist institutions."

The directive is published in the 1988 legal gazette, Part 1, No 8, dated 28 April 1988; the other two documents can be obtained from the ZIID at no charge.

This resolution affords State agencies, combines, enterprises and scientific institutions the possibility of using remote access to data banks and other information resources in the CEMA member nations for the acquisition of information not available in the GDR in scientific and technical fields, and makes available access to strategic concepts for the application of key technologies in a workplace environment.

The documents contain regulations concerning the following:

- the responsibility of the ZIID for organizing participation of institutions in automated information exchange, and their support in the implementation of the resolution;

- planning and financing tasks, as well as commercial questions which deal with obtaining and providing available on-line information services;

- technical support and protection (control and switching; data security) of remote access by institutions within the GDR and abroad to data banks and information services via the newly-established master terminal in the ZIID;

- bringing about conformance with the regulations stipulated in the resolution in cases in which institutions are already participating in international information exchange.

Summary

The data bank and data communications network, a joint project involving the CEMA member nations, is scheduled to begin continuous operation in 1995. To do this, the scope of the network is continually under development. It is being expanded as the contributions of the individual countries are integrated into the overall network, and as the results of joint, multilateral projects are realized. These projects, for example, concern the equipment destined for use in the network, the technology of packet switching, software for continuous automation of on-line interactive research, including automatic connection to the desired data bank or information resource.

This development places ever increasing demands on user qualification, as well as specially-developed capabilities and skills on the part of the researchers. These increasing requirements must be taken into consideration through a continuing methodological training program, for which the ZIID bears responsibility. These measures must also meet new requirements expected to result from the commissioning in 1991 of the automated data network of the German Postal Service.

The objective of the resolutions introduced in the GDR is wide use of foreign on-line data banks and telecommunications services on a national economic level. In order to realize this goal, stable operating conditions must be ensured in the near future, so that the new potential for quick access to information in a workplace environment by State agencies, combines, enterprises and scientific institutions can be put to economically effective use in the application of key technologies in research and development and for strategic projects.

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